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Our Railways

THE publication to-day of the Weir Report on Railway Electrification is easily the most important event for our industry since the passing of the 1926 Act, which was itself based upon the findings of a committee which sat under the same chairmanship. It is fitting that the present report should also be known by the name of Lord Weir of Eastwood, as it owes its origin mainly to the existence of a national grid system.

There is certainly very much to be said for its recommendations from an engineering point of view, and we are glad to see that the scheme is conceived right from the start as an organic whole, just as the grid was. The most striking feature of the Report is the recommendation "to go the whole hog" of main-line electrification instead of making the worst of both worlds by dual working with steam locomotives and electric tractors.

Granted the correctness of the calculations—and enough data are available in the world to make these reasonably reliable, as main-line electrification is no new thing—a net return of nearly 7¼ per cent. as interest on capital expenditure is sufficient justification for going straight ahead, if—and the "if" may be a big one—the difficulties of financing so gigantic a scheme can be surmounted. The case is strengthened by the fact that the return has been conservatively estimated on the existing slump conditions and without any allowances that might reasonably have been made for the improved traffic loads which have been found hitherto to follow electrification. The effect on the cost of energy to other consumers is also bound to be beneficial because, even if the Central Electricity Board were to supply at little over cost price, experience of the effect of large high-load-factor consumers is to alter the whole conditions of generation with resulting over-all economies.

Objections will no doubt be heard on the grounds of heavy capital expenditure, the scrapping of locomotives, the loss of about half of a coal market, and the displacement of staffs. One broad answer may be given, and that is the conversion to electricity will not be carried out in a few months; the period allowed is 15 years. We have shown above that the return on capital is likely to be 7¼ per cent. *plus*, and this gives a sound commercial scheme under suitable financial conditions; within 15 years most of the existing steam locomotives will have reached the end of their useful lives; and the stimulus given to electricity production at lower prices for industry as well as the railways may confidently be expected to result in a compensating increase in the consumption of coal and the employment of operating men.

The proposals of the Report are bold, but their very boldness will, we believe, make an appeal to the public imagination and recommend them to a people ready to adopt drastic measures to relieve the prevailing industrial depression. Indeed, these proposals now under mention provide the only constructive and financially solid large-scale scheme of relief yet put forward. More-

over, we cannot without disaster continue to put our skilled workmen on to road making, on which, incidentally, we have spent far more during the last 13 years than the whole amount required for the complete electrification of our railways.

If the present report is embodied in legislation, the electrical industry, which has been steadily gaining traction experience overseas, would have a magnificent chance to show how it can use its opportunities in a home market.

Australia

Mr. R. W. Dalton, whose report on the situation in Australia is abstracted in this issue, is better known to the electrical industry than has been any other of His Majesty's Trade Commissioners. Before the war his official duties with the Board of Trade in London gave him an insight into our electrical import and export trade, and his work in connection with the British Industries Fair, in its early days, combined with that experience, qualified him for responsibility in Canada as a Trade Commissioner. British electrical manufacturers have good reason to remember the valuable aid that he rendered later in New Zealand, when he was our Trade Commissioner there. Later Australia claimed him, and it is satisfactory that during the present critical period our interests there are being handled by him. Present difficulties cannot alter the view expressed by Mr. Dalton that the country is only at the beginning of its development. Where will Britain stand in meeting the electrical demand that inevitable new development will bring? In our opinion the Australian electrical manufacturing phase will not be permanent in many lines. Prices charged for locally-made electrical products are often so high as to appear to us ridiculous; uneconomic production must restrict progress. Our electrical manufacturers will not throw the market over because of present difficulties. American competition is not dead; and we must be fully alert watching every turn in the situation.

English Electric

The reorganisation scheme of the English Electric Company, Limited, having coincided with a period of acute trade depression, produced a number of extraordinary difficulties during 1930. Sir Holberry Mensforth, the chairman, in reviewing the situation, referred to the disappointing character of heavy electrical plant business in the Home market in respect of both volume and price, and to the unsatisfactory conditions in the export market—Australia and India in particular. The changes in the constitution of the board have included the appointment of a well-known expert (Mr. G. H. Nelson) as managing director, and rearrangement of production as between the company's various factories has been effected. The full benefit of the changes can only be felt when trade revives, but Sir Holberry speaks with confidence of ability to compete effectively when that greatly desired revival occurs. The company has carried out a good deal of railway electrification work, and its practical experience should place it in a favourable position for securing a good share of the very welcome business which will come to all manufacturers of its class if the great schemes advocated by the Weir Committee are adopted.

The Shop Lighting Campaign

In this issue we summarise a report upon the Shop and Display Lighting Campaign which was conducted last autumn by the Electrical Development Association and E.L.M.A. At first sight to circularise 200,000 "prospects" and receive only 3,600 replies may seem a poor result, but that is not the whole story. Most people are afraid of committing themselves by immediately responding to invitations issued by those who have something to sell, but, if the "message" is a good one and reaches home, a definite impression is made and results can be expected sooner or later. In this case the circulars were sent to shopkeepers, and a preliminary survey had shown that shopkeepers as a whole were not illuminating their premises to anything like an adequate extent. The attractively-produced and convincing booklet sent to them must have brought them to a better appreciation of good lighting and the lesson must have been further driven home by the other methods adopted by the campaign organisers. We have no doubt, therefore, that the campaign will ultimately result in more business for the makers of lamps, lighting fittings, and signs and for the electrical contractors who will be called upon to install them.

"Economy" at Bristol

Mr. H. Morrison, the Minister of Transport, visited Bristol recently to urge upon electricity supply undertakings in the West of England a policy of development and enterprise. In one respect he was preaching to the converted, for it was stated at a meeting of the Bristol City Council a few days later that the Electricity Department was so far in front of the demand in its development that it was difficult to load up the distribution system. It was therefore proposed to appoint a sales engineer to organise publicity work and demonstrations and thus secure the badly-needed consumers. Only by the sale of more energy, it was pointed out, could the price per unit be reduced. The suggested appointment was opposed on the grounds that the Committee had already spent enough; that the local contractors would be adversely affected; and that the price of electricity was too high. These points were replied to by the Electricity Committee. One remark made by one of the opponents is deserving of being placed on record. It was that last year £29,000 was contributed to the relief of rates from the profits of the undertaking. In the circumstances we think that the appointment of twenty-nine sales engineers would have been a better investment.

Use Bakelite

Greater advantage should be taken of what represents one of the biggest advances made in recent years towards the cheapening of production within the electrical manufacturing industry, namely, the introduction of bakelite or similar proprietary moulded materials. High-quality finish, quickness of production and other assets, make it difficult to over-estimate the value of bakelite to the electrical industry as a whole, and also render it rather surprising that the use of the material has not been extended more than it has. To take only one example, the cheapening of the lampholder must be of immense value. There are, of course, many cases for which the older constructions of apparatus are more suitable, and the question has a bearing also on "earth or insulate," but generally speaking the moulded method can be almost universally employed. Success depends, of course, on quantity production, and confidence is required by the manufacturer to put down expensive moulding plant. The moral for all, then, is use bakelite.

Engineers by Marriage

The daily Press, in reporting the one-day Conference of the Electrical Association for Women last week, referred, in some cases, to the members as "women electricians." This designation is incorrect and likely to mislead potential members. It is true that at the core of the Association is a body of women working in the industry, but the bulk of the membership is made up of those who see in electricity a means for giving women opportunities for making the most of their lives (engineers may see in the E.A.W. an indispensable help in selling more electricity, but that is another matter). For membership enlightened public spirit and an intelligent interest in social progress are requisites, rather than technical knowledge or mechanical aptitude. Many of the keenest workers are, like their president, Lady Moir, "engineers by marriage." Mrs. Wintringham at the E.A.W. luncheon referred to close co-operation in work between man and wife as characteristic of the countryside, but it applies in the urban electrical industry also.

Main-line Railway Electrification

The Weir Committee has recommended to the Ministry of Transport a comprehensive conversion scheme to be applied nationally which is estimated to cost £400,000,000 spread over a period of fifteen years, provide employment for some 60,000 men, stimulate manufacturing activities, and cheapen and facilitate electricity supply generally throughout the country

WIEN its report is published to-day (Friday) it will be found that the Weir Committee takes the view that the electrification of the railways should not be allowed to proceed by piecemeal stages, for it is in favour of the transformation from steam to power locomotion being achieved by a single comprehensive scheme, as was revealed by the Lord Privy Seal in the House of Commons last week (see page 732 of this issue) and amplified later by the *Daily Telegraph*.

If the proposals are adopted, the railway companies will be called upon to convert their own lines to electric traction, and to provide or adapt their rolling stock for the purpose. They will not incur any capital expenditure whatever on generating plant, as it is proposed that the Central Electricity Board shall be authorised to supply power to the railways direct, and not through the medium of distribution undertakings as is the case with industrial and domestic consumers. Under these conditions the railways will obtain their power at a figure lower than that in many other countries, possibly at a price of the order of 0.5 to 0.4d. per kWh.

The Committee

Appointed by the Socialist Government in September, 1929, the Committee on Railway Electrification consists of Lord Weir of Eastwood, chairman, who presided over the inquiry which led to the evolution of the national electricity generation scheme; Sir Ralph Wedgwood, general manager of the London and North-Eastern Railway; and Sir William McLintock, auditor of the Central Electricity Board. Its terms of reference were: "In view of the progress which is being made towards widespread availability of high-tension electrical energy, to examine into the economic and other aspects of the electrification of the railway systems in Great Britain, with particular reference to main-line working."

It is claimed that, apart from the advantages that should accrue to the railways themselves, industry generally will benefit from the conversion by the still cheaper supplies of power it will make available.

It is held that main-line electrification will mean a much lower rate of depreciation, for the life of a steam locomotive rarely exceeds twenty years, whereas an electric tractor will remain efficient for thirty years at least and, as the technical standard is already high, there will be no need of replacements because newer models are coming forward.

No fewer than 60,000 men, it is estimated, will be given direct continuous employment if the scheme is carried out, and there should be no adverse effect whatever on the existing staffs in the railway workshops.

Cost of the Project

The £400,000,000 which the scheme will cost is estimated to be spread over fifteen years. Of the total cost, it is estimated that £80,000,000 will be incurred by the Central Electricity Board and £320,000,000 by the railway companies; certain substantial savings, however, may reduce their net figure to £260,000,000.

The Weir Committee, it will be found, has omitted the question of suburban electrification from detailed examination, partly because it would have been impossible to make any reliable estimates and partly because the companies are already electrifying their own suburban services. A sum of £45,000,000 is named as the capital cost of the completion of suburban electrification. The likelihood that this will yield a return of over 13 per cent. is sufficient and abundant justification, it is urged, that it should be undertaken.

In arriving at its estimates of the cost and potentialities of main-line electrification, the committee had the advantage of two interesting surveys that were made by the railways themselves, in one case on the London and North-Eastern system between London and York, and in the other on the London, Midland and Scottish system between Crewe and Carlisle.

The L.N.E.R. "test" was based, on the one hand, on the assumption that the entire length of the track, and every type of traffic passing over it, was operated electrically, even work in sidings.

Return Expected

By means of the most careful calculations, allowing for the cost of installation, it was found that electrification would bring a return of 7.22 per cent. on the capital expenditure. The survey was made conservatively in relation to the slump conditions which have existed on the railways during the last few years; no allowance was made, that is to say, for any likely improvement in traffic loads, in the number of passengers carried, or in the diversion of goods traffic back from the roads to the railways.

The L.M.S. "test" was based, on the other hand, on a form of dual working. It was assumed that passenger trains were all to be electrically operated, but that all goods traffic and shunting were still to be worked by steam power. It was worked out that the return on such partial electrification would be only 2.05 per cent.

From these estimates the conclusion reached by the companies themselves was that, if electrification were to be undertaken, it would not be worth while to undertake it piecemeal, but that it would be wiser from the first to "go the whole hog." Incidentally, the result of the survey has been held to have discounted the view that it would be wiser to begin railway electrification with the suburban services; then to link up electrically chief centres of population, such as London and Birmingham, or Liverpool and Leeds; and ultimately to extend to the main and subsidiary lines throughout the United Kingdom.

The total length of single railway track in Great Britain is 51,000 miles, of which some 1,300 miles have been electrified. The number of steam locomotives owned by the railway companies is 23,000, but not more than 1,500 locomotives and other vehicles are driven electrically at present.

Manufacturers' Views

The report of the Weir Committee is, from the point of view of the electrical industry in this country as represented by the British Electrical and Allied Manufacturers' Association, the most important document which has been issued since the 1926 Electricity (Supply) Act. Should its recommendations be translated into legislation, the result upon the general industrial prosperity of this coountry should be immediate, and a very important step towards the solution of the unemployment problem will have been taken. So far as is at present understood, the recommendations include the entire electrification of all the railway systems in this country, involving an expenditure of approximately £400,000,000, to be spread over the next thirteen years. Of that total, £80,000,000 will represent expenditure to be incurred by the Central Electricity Board on the necessary extensions of the national interlinking transmission grid to make that system available for transport work; and the remaining £320,000,000 will represent expenditure by the railway companies themselves. Of the latter total, the conservative estimate would put the figure in connection with the conversion of the main lines at £50,000,000, while a further £30,000,000 will be represented by rolling stock.

Thus the total value of the contracts that may be expected to accrue to the electrical manufacturing industry resulting from the proposals of the Weir Report can be put at £160,000,000, or £12,500,000 per annum. As the total production value of electrical and applied

machinery and cables is understood from B.E.A.M.A. to be in the neighbourhood of £40,000,000 per annum at the present time, the addition of such an amount, assuming that the contracts be placed in this country, will represent an increase of slightly more than 30 per cent. to the annual output in these categories. With regard to employment, as the annual output per man in electrical engineering is worth about £400, it is probable that these contracts will represent an addition of about 30,000 workers, or 25 per cent. on the numbers employed in these branches. The effect upon the electrical manufacturing industry will be, therefore, very great indeed. In addition to this, such an increase in the production of electrical railway equipment in this country will strengthen the export position in these goods, for, as B.E.A.M.A. points out, it is only by having a large turnover that a surplus can be obtained which can be exported at competitive prices.

Effects of the Conversion

With regard to the effect of the recommendations of the Weir Report upon the supply situation in this country, it is probable that the resulting increase in generation which will be necessary to meet the demand from the full operation of the electrification proposals will be about 70 per cent. above the normal estimated annual increase for authorised undertakers. Such an increase, it is obvious, will very materially help the development of the grid, and in particular its operation, for the load which it represents is one which will not be affected to any extent by seasonal or daily fluctuations. The existence of such a load, even if it is distributed at cost, will bring down the price charged to other consumers, which, in its turn, will further very materially the industrial and rural uses of electricity.

The benefit to the public of the general electrification of the railway system in this country will, in the main, be represented by faster runs. The average length of a railway system in this country is comparatively short, with many stops, and for this reason an electric train fitted with motors capable of developing an overload of as much as 100 per cent. is capable of a much higher degree of acceleration than a steam train, and also of developing sufficient power to cope with steep gradients. The factors of rapid accleration and power reserve must inevitably increase the average speed of a train and thus shorten the scheduled time for a journey.

It is unnecessary to point out that the results of the recommendations will be of national significance, particularly at a time when it is generally agreed that only very drastic measures will be capable of dealing with the general industrial and employment positions. So far-sighted and ambitious a scheme deserves therefore the whole-hearted backing of the general public, not less than that of the industry as a whole.

Existing Electric Railways

The first electrically-worked system in the British Isles was the City and South London tube, from the Monument to Stockwell, which was opened in 1890. The Liverpool railway, the first overhead electric system in the world, was opened three years later. The first of the main-line companies' lines to be electrified was the Tyneside branch of the North Eastern Railway; 30 miles of line was converted to electrical working in 1904. Of the 1,300 miles of single track so far electrified throughout Britain, nearly 900 miles are on the Southern system, and that company is now engaged on plans which, when completed, will make its electric system the largest in the world.

Wireless Communication in Africa

Marconi Plant has been Ordered for the Equipment of a Chain of New Stations

A COMPREHENSIVE system of radio communication is to be established in South and East Africa, orders having been received by Marconi's Wireless Telegraph Co., Ltd., from the local administrative authorities for the erection of a chain of transmitting and receiving stations that will be utilised for the operation of the new Cape to Cairo air route (the aircraft being also equipped with Marconi apparatus) and in the case of six of the twelve stations for general communication as well. Sites for the new stations have been decided upon in the proximity of Kampala in Uganda; of Nairobi in Kenya Colony; of Moshi, Dodoma, and M'Beya in Tanganyika; of M'Pika and Broken Hill in Northern Rhodesia; of Salisbury and Bulawayo in Southern Rhodesia; and of Germiston, Victoria West, and Cape Town in the Union of South Africa.

The wavelength to be used for aircraft communication will be 900 metres, short waves will be used for inter-aerodrome services, and for general communication special wavelengths have been allotted to the stations at M'Pika, Broken Hill, Bulawayo, Salisbury, Germiston, and Victoria West, which will be used for this purpose.

Five types of short-wave transmitters (S.3A, S.3B, T.N.7, T.N.7A, and S.100B) are to be installed according to the class of service and the wavelength required in each instance. Type S.3A has been developed recently to cover efficiently the very wide range of frequencies extending from 18,750 to 4,000 kilocycles (16 to 75 metres). This transmitter is normally rated at 1 kilowatt, this being the output of the high-voltage direct-current generator used for supplying power to the anodes of the magnifying valves; it incorporates quartz-crystal and master-oscillator control. Type S.3B covers from 1,500 to 3,000 kilocycles (20 to 100 metres) and Type TN7 is similar, except that the quartz crystal is replaced by an independent-drive circuit, it being also manufactured in two models; one operating over a frequency of 18,750 to 4,000 kilocycles (16 to 75 metres) and the other from 1,500 to 2,222 kilocycles (20 to 185 metres). A simple and easily operated transmitter is Type S.100b, which is fitted in some of the stations; it covers a frequency range of 1,000 to 5,000 kilocycles (30 to 60 metres) and under normal conditions very long distances can be covered.

For operation on medium wavelengths the equipment is to be of Types TA4a and MC6. The former has a power input of 2.2 kW and is suitable for transmission over the wave range of 400 to 1,550 metres. The latter, which was originally developed as a powerful marine transmitter for use on large ships, covering the wavebands of 600 to 800 metres and 1,900 to 2,500 metres; it has a power input of 2 kW, but if working over shorter ranges this can be reduced to about one tenth if required.

The receivers to be employed will be principally the commercial Types RG.27 and RG.28. The former covers a frequency range of 2,000 to 100 kilocycles (150 to 3,000 metres), and the latter covers the short-wave range from 10 to 200 metres.

The stations at Germiston and Victoria West are to be equipped with the Type RG.14 directional receiver, as fitted at the London air port at Croydon; operating on the Marconi Bellini-Tosi system, it has proved its value in many important aerodrome stations in various parts of the world.

It is of interest to record the fact that Mr. T. A. Vallette, a Marconi engineer, accompanied Lieut.-Commander Glen Kidston on his recent record aeroplane flight from England to South Africa and greatly assisted him by picking up weather reports and other information which aided navigation by means of a Marconi Type AD.18a aircraft receiver. This apparatus incorporates an aperiodic aerial system coupled to a tuned closed circuit for high-frequency selection, and three valves. The first valve is of the screened-grid type for high-frequency amplification; the second is a detector valve with a tuned grid circuit, operating on the grid-leak method of rectification and is provided with capacity reaction control; and the third is a transformer-coupled low-frequency magnifying valve. This receiver, which is extremely selective, covers the waveband of 300 to 1,800 metres.

Not only in the air but also at sea almost every type of vessel afloat, from the largest passenger vessels to fishing trawlers, sea-going tugs, lightships, and in many well-equipped ports even the harbour vessels, are fitted with wireless apparatus to assist them in the efficient performance of their important duties. Special semi-portable types of telephone and telegraph equipment, which can if required be easily transferred from one boat to another, enable the crews to keep in touch with their headquarters ashore in order to receive instructions regarding their operations and to report progress. Much valuable time is thus saved in journeying to and from the working places, and special operations on the part of the wireless-equipped vessels are rapidly facilitated by the use of an immediate and efficient means of communication.

The Basra Port Trust, which some six years ago equipped five of its control and pilot vessels in the Persian Gulf with Marconi Type Y.B.1 equipment, has recently confirmed the utility of these installations by ordering two more similar sets to be supplied by the company. By means of this type of apparatus, which has a transmitter of a power of 100 watts capable of either telegraph or telephone working, all the vessels keep in touch with each other and the Port Trust's stations ashore. A wireless call bell is included in each installation, so that there is no necessity for maintaining a continuous watch and any vessel or station can call any of the others with the facility of an ordinary telephone. Indian signalmen operate the stations with great proficiency, telephony being generally employed.

Lighting Transforming Stations

The use of Prismatic-glass Lanterns is Advocated as Involving fewer Disadvantages than other Systems

By H. E. HUTTER

THE systems described in a previous article entitled "Outdoor Sub-station Lighting" (Electrical Review, March 13th, 1931) have a number of disadvantages which are inherent and cannot be overcome. So far the only systems designed which overcome most of these faults are those utilising prismatic-glass constructions. Reference to the earlier article will give a list of desirable qualities for an installation for this class of work.

Fig. 1.—Transformer Bay of Outdoor Sub-station at Night

It is a well-known law that a ray of light passing through a glass prism is refracted according to the shape of the prism; it is also possible to reflect the ray back in any desired direction. Fig. 4 shows the construction of these horizontal prisms and also the refractor assembly. Two classes of refractors are used for this class of work. (1) The bowl type, which is almost closed at the bottom, the inner member having refracting prisms covering the whole of the inner surface. This class therefore controls the entire light output of the lamp; it can be made in various forms: symmetric, asymmetric, and other special forms which are not much use for this work.

(2) The dome type is a special type to be used inside another bowl; this enables the outer member to be replaced by another member having a further series of refracting prisms. The refractor has therefore horizontal refracting prisms on both the inner and outer members, excepting the asymmetric types, which have a series of reflecting prisms on one side to give the asymmetric light distribution.

The overhead system with prismatic lanterns is similar to the overhead system described previously, with the exception that the plain reflector fittings are replaced by lanterns fitted with prismatic glass refractors or globes. A typical example of these fittings is illustrated in fig. 5. The lanterns mounted towards the centre of the structure would be fitted with symmetric-type refractors, to distribute the light equally in all directions in a horizontal plane, while those mounted towards the outside of the structure and where it is not particularly desired to illuminate the areas external to the station would be fitted with the asymmetric type. These throw all the light through an angle of 180 deg. in a horizontal plane; lamps with wattage up to 500 may be used with these fittings.

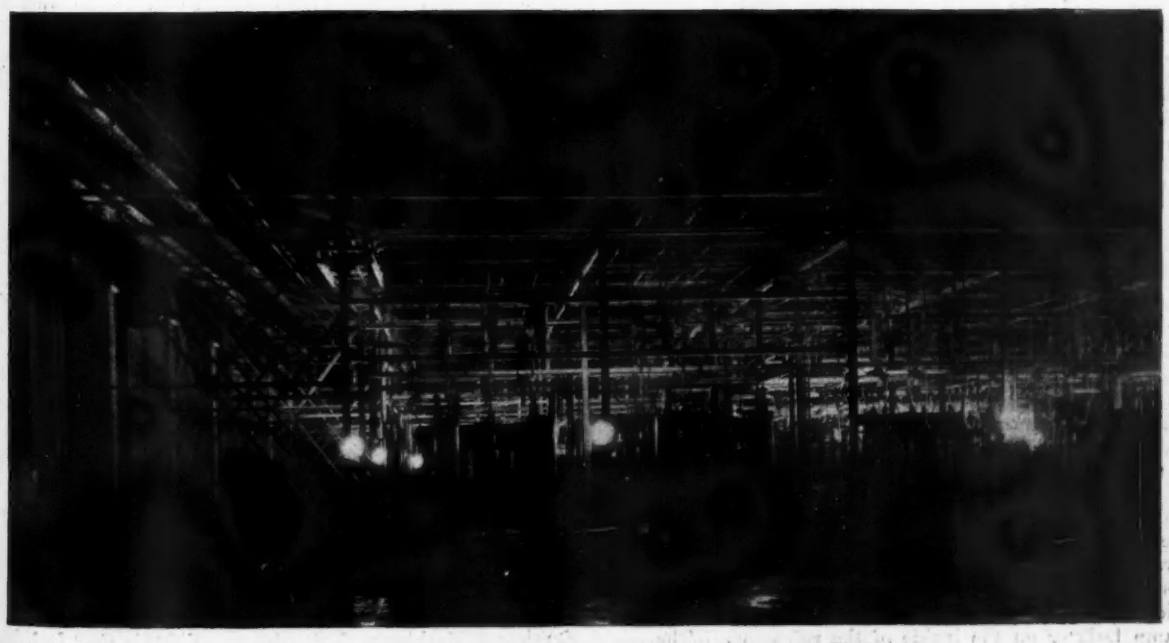


Fig. 2.—Large Sub-station Illuminated with Prismatic Fittings

Arrangements must be made for the accurate focusing of the lamp when used in conjunction with any form of prismatic-glass ware to obtain the maximum efficiency; adequate ventilation must also be provided to prevent overheating of the bulb, and at the same time the whole fitting must be weatherproof.

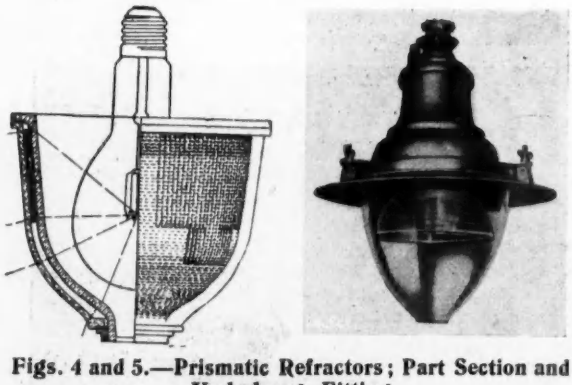
With fittings of these types great difficulty is often experienced in placing them exactly where required, as suitable positions on the undersides of girders are often already occupied with under-hung isolating switches and other gear. Brackets with 3 to 4 ft. extensions may often conveniently be used. The lanterns project most of the light downwards, and, if it is desired to illuminate overhead gear such as the bus-bars, these fittings must be mounted in an inverted position.

Fig. 3.—Portable Floodlight

The special unit used for post type fittings (shown in fig. 6) employs the principle of refraction rather than reflection, because by refraction the wide-angle light distribution required can be realised, and dust tight construction is practicable. The units are mounted either on the towers, brackets, or cast-iron posts located between columns in positions that will not interfere with the movement of transformers and other apparatus. It is to be noted that due to the high candle-power values at small angles to the horizontal, the vertical illumination component will be high. Spill light from the refractor which is not controlled by the refracting prisms is useful for illuminating the ground; the angle of maximum candle power may be varied when the lamp is burning by loosening a lock nut and turning the entire unit, thereby raising or lowering the lamp with reference to the refractor.

The wide light distribution insures good overlapping in distribution, so that the apparatus in each bay receives light from all the adjacent bays. In this way a shadow caused by an opaque object in the path of the beam from one unit is illuminated by several adjacent units.

Glare is eliminated by refracting the light from the lamp upwards so that it falls on the structure instead of in the eye, the operator looking in a direction along the light instead of against it. When the unit is mounted on a post the exact height of the unit above ground is found by drawing a line from the part to be illuminated



Figs. 4 and 5.—Prismatic Refractors; Part Section and Underhung Fitting

to the lighting unit. The height of the unit should be such that the angle formed by this line and the axis of the light unit should lie between 65 and 80 deg. By keeping the light units about 9 ft. from the ground, danger of contact with high-voltage parts is eliminated.

It will be noted that the unit is constructed to minimise temporary dust and dirt depreciation, and the heavy galvanised cast-iron housing and clear-glass refractor and globe will stand up to all kinds of weather conditions. The lamp is sealed completely from the outside air so that dirt cannot accumulate either on the lamp bulb or on the inside of the refractor. The refractor is made in two pieces permanently locked together so that all the refracting prisms are sealed from contact with the air. The hood and holder for the outer globe are drilled for drainage, so that any water that might collect by condensation or leakage will be provided for. One unit with a 300-watt lamp will be found sufficient for a bay 30 by 30 ft.

The maintenance of the installation when in use is a matter of the greatest importance, for, no matter how carefully the design has been carried out, rapid depreciation will occur unless regular cleaning of the fittings is carried out. Units mounted on poles and on the underside of girders require some form of lowering gear to enable cleaning and relamping to be done in safety.

While the installation may give adequate illumination for routine work, it may be insufficient for fine adjustment work on switches, &c. To provide for additional illumination, plug sockets should be fixed at the base of suitable columns, to allow the use of the conventional handlamps, portable floodlights (either with a concentrating beam for use when the gear is mounted high up on the structure, or, alternatively, an extensive beam for use on gear low down), the actual floodlight being mounted on a tripod or carriage as considered most suitable. Fig. 3 illustrates a G.E.C. pole-mounted floodlight.

Methods of wiring and switching are more or less dependant on the ideas of the designer, and no general

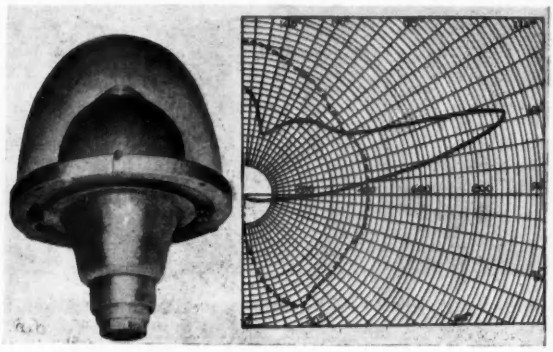


Fig. 6.—Pole-mounted Prismatic Fitting

rules can be laid down. Taking a case in which the lighting installation is divided into two parts, one for normal use and the other for repair work, the latter portion should be arranged so that it can be switched on in sections according to where the light is required. The first portion can be subdivided into suitable portions so that, in the event of a fuse blowing or other breakdown, only a small section of the lights will be out. In the other alternative, where all the fittings are used, the circuits can be subdivided as required, no portion of the station being in total darkness in case of breakdown; the switches and fuses can be suitably mounted in the control or auxiliary house on the actual station, and when required a switch can be placed at the entrance gate of the station to enable a few lights to be switched on so that convenient access can be obtained to the control house. The voltage of the lighting is of no great importance, being usually the same as the voltage for the auxiliaries; voltage drop in the leads is, however, of the greatest importance if the efficiency of the units is to be maintained.

A wide scope is offered in the selection of the cabling depending on the method of laying to be adopted. The average station is usually well laid out as regards the trenching for small cabling, and full use of this should be made when convenient; alternatively, conduit can be used, or a suitable cable can be laid direct in the ground. Where cables mount the towers or when running along the girders they should be securely cleated to the structural members; the cable should be protected where it leaves the ground for the towers.

The author has to thank the following firms for their assistance by the loan of illustrations for this and the previous article: Messrs. Holophane, Ltd., Benjamin Electric, Ltd., Westinghouse Co., Delta Star Co., Korting & Mathiesen, Ltd., General Electric Co., Ltd., and the British Thomson-Houston Co., Ltd.

The Billingham Generating Plant

High pressure and temperature steam usage has resulted in the lowest generating costs in the world

A COMPLETE description of the power plant at Billingham of Synthetic Ammonia & Nitrates, Ltd., a subsidiary company of Imperial Chemical Industries, Ltd., was given in a paper presented to the Institution of Electrical Engineers by Mr. H. A. Humphrey, Mr. D. M. Buist, and Major J. W. Bansall (Electrical Review, March 21st, 1930, p. 562). The following notes summarise some of the main points given with regard to the generating plant, which was supplied by the Metropolitan-Vickers Electrical Co., Ltd., and the accompanying photographs are copyright by Synthetic Ammonia & Nitrates, Ltd., and are reproduced by permission.

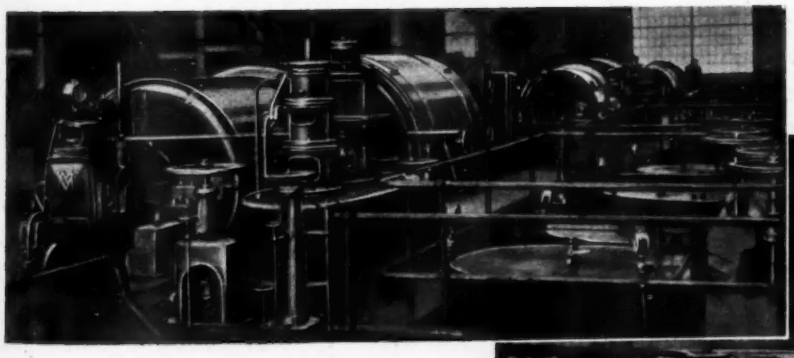
The main generating equipment consists of eight turbo-alternator sets, *viz.*, three 12,500-kW m.c.r. primary sets, two 12,500-kW m.c.r. condensing sets, and three 6,000-kW m.c.r. feed-heating sets. All these machines run at 2,400 r.p.m. and generate at 6,600 V, three-phase, 40 cycles, an important consideration affecting the selection of the frequency being an existing contract for a bulk supply at 11,000 V, 40 cycles, from the North Tees power station of the Newcastle-upon-Tyne Electric Supply Company. One set in each group of machines is used as a spare. The remaining condensing set carries the present balance of load, but the two machines can be used together, and provision has been made for adding a third similar set. The steam connections are arranged so that the flow is from the boilers to the primary turbines, thence to the feed-heating and distillation plants, and finally back to the boilers, constituting a simple ring with a tee-off to the condensing sets and one to the factory for process purposes. As a standby and to provide for any sudden increase in the quantity of steam required, reducing valves with de-superheaters are installed as by-passes to the primary turbines. The primary turbo-alternator sets constitute one of the chief items of interest in the plant, especially the turbines, which are unique. The turbines are supplied with steam at 645 lb. per sq. in. and 833 deg. F. They are single-cylinder machines and have sixteen stages. Under normal operating conditions the by-pass reducing valves remain closed and each of the two high-pressure turbines takes some 244 tonnes* of steam per hour, generating 11,900 kW at an overall efficiency of 74 per cent. and exhausting at 290 lb. per sq. in. into de-superheater secondary receivers.

The requirements for dealing with such a large quantity of steam at high temperature and pressure necessitated departure from the usual steam-chest practice. Each turbine has two inlet steam chests in parallel, one on either side of the inlet end of the turbine. To these chests the high-pressure steam is supplied through four 9-in. pipes and stop valves, two per chest, and steam passes from the chests to the turbine *via* four 9-in. arched pipes or bends. By this arrangement a far greater degree of steam-pipe flexibility is obtained than would be possible if one or even two pipes of larger diameter were used. The exhaust end of the turbine is similarly equipped with two steam chests, which are connected to the cylinder by four 12-in. pipes. Two inlet and two exhaust pipes are arched above the turbine and the other two inlet and two exhaust pipes are correspondingly arched below the turbine, this arrangement eliminating unbalanced thrusts on the cylinder.

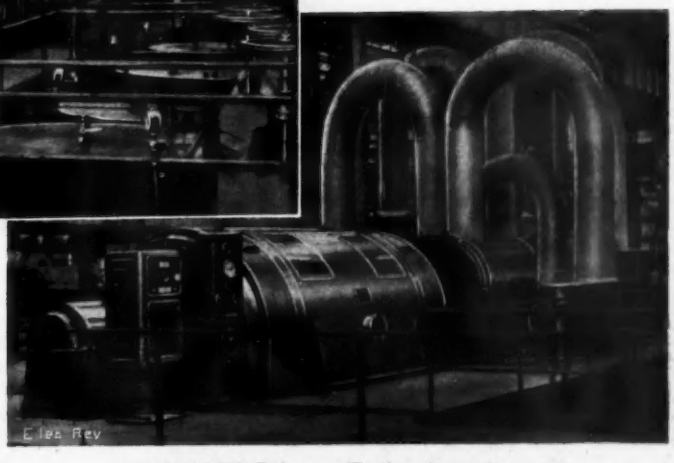
A Primary Turbine Set before Lagging

From the secondary receiver system into which the primary turbines exhaust the steam is distributed to the process plant, the condensing turbines, the feed-heating turbines, the 7th stage feed-water heaters and some auxiliary services. The regenerative feed-heating system comprises seven stages, the feed-water being progressively heated to 401 deg. F. Steam for the first two heaters is derived from water evaporated in the distillation plant, which virtually acts as a condenser for the feed-heating turbines. The steam for the next four stages is bled from the feed-heating turbines. The turbines are single-cylinder, 6,000-kW machines fitted with relief and non-return valves on all steam-bled connections. In normal operation each feed-heating turbine takes 1,310 tonnes of steam per day and exhausts to the distillation plant at 12.73 lb. per sq. in.

The condensing sets are provided to utilise the remainder of the steam exhausted by the primary turbines and to act as equalisers for the system. The conditions of service do not permit of fluctuations of load being carried by either the primary or the feed-heating turbines. All fluctuations in steam or electrical output are therefore carried by the condensing sets.



Feed-heating Bay; 6,000-kW Machines



12,500-kW Primary Turbo-alternator

* 1 tonne=1,000 kg.=2,204 lb.

Pole-line Insulation

An unorthodox method of construction which is claimed to possess many advantages over standard types

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

FOR a wood pole the calculated fibre-stress ratio (7800/3.5), the moment (d^3 63.8), and the pole diameter ($\sqrt{128}$ P/3.14 TF) remain the same whether we make use of a wood arm and wood brace, or a steel arm with or without a steel brace. To be exact, the mechanical strength of a pole should be calculated for the winter conditions prevailing, but actually it is based on the regulations of the Electricity Commissioners.

It is commonly accepted that the most costly and weakest unit of the three units—the pole, arm, and brace

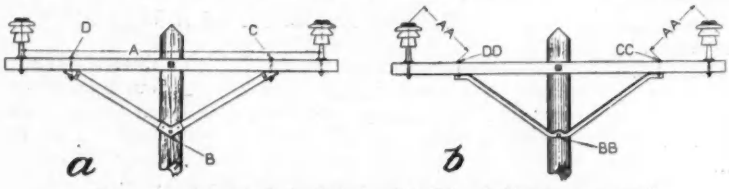


Fig. 1.—Wood Pole fitted with Wood Cross-arm and (a) Wood Braces, and (b) Steel Braces

—is the pole. Hence, from the mechanical strength and cost viewpoints, we may well decide on the cheapest material—treated wood.

Generally speaking, the more important of the two strengths—mechanical and electrical—is the latter. The E.C. regulations demand a valuable loss of electrical strength in the pole and crossarm and braces; this seems strange, since experience of the world's practice shows that breakdowns and increased voltage stresses occur where metal fittings are used on, and/or where metal fittings are earthed on, wood poles.

It has long been considered unwise with wood-pole construction to bring the earth up to the insulator-pin and to bond the pole ironwork. For treated wood-poles with treated crossarms and braces, direct earthing of the two latter will result in loss of valuable insulation, and if a continuous earth wire must be used, it should be properly insulated from the pole, but earthed at frequent specially-prepared tested points on the line and at line terminals as well.

Insulating the earth wire from the " semi-insulated " poles, and from the metal fittings on the poles throughout the line, will greatly increase the insulating value of the entire line, improve operating service, dispense with the greater number of bird and other line troubles, usually decrease line costs, and permit every advantage to be taken of the non-conducting properties of the earth surrounding and in contact with the pole, as the result of creosote penetrating and mixing with the surrounding earth.

Earthing wood crossarms, and/or braces of metal or wood, is poor practice in a wet country or/and in a country where lightning is frequent. A continuous earthed-wire, run from pole to pole, may be most active as a combined lightning conductor and arrestor where the wood pole is used as a path for a potential discharge, as is the case with the present practice of earthing, &c., which increases the chance of the pole or poles being split or shattered.

Good practice means that provision has been made in the design and operation of a line to have, retain, and maintain, the maximum aggregate insulation as well as the maximum mechanical strength of all the materials *actually needed* for the best, safest, and most economical pole line.

The wood crossarm and the wood brace are used to increase the flashover value between phases and prevent power arcs from forming when insulators are overstressed due to surge voltages, or induced voltages from lightning, and leakage from weakened insulation, &c. Actual practice proves that the wood arm and brace, as compared with the metal arm and brace, have distinct value and have been very successful in the improvement of line operation in particular.

The excessively high outages from bird troubles, and the constant cry for " protective devices," insulating shields, and the like are merely the outcome of present day practices. Wood, as a support (pole, arm, and brace), offers a very high potential gradient for induced charges—approximately 35,000 volts per ft. of height above ground line, or nearly 1,000,000 volts for the average overhead line. The common use of steel crossarms and the bonding of pole-fittings rapidly decreases the flashover value of a line, because the earth is brought up to the level of the insulator-pin at the pole only, and at a point (or points) on the line where insulation should be kept as close as possible to that in the mid-span (or mid-spans) or earthed separately from the pole and/or its fittings.

In the accompanying illustrations, figs. 1 (a) and 1 (b), are shown the relative flashover distances, respectively, which obtain on a wood pole fitted with wood crossarm and wood braces, and a wood pole fitted with a steel crossarm and steel braces. The flashover distance, lost height, and insulation are obvious from these two figures.

It will be noticed that whereas in 1(a) the minimum flashover distance is A (*i.e.*, between insulator pins), in 1(b) the distance is reduced considerably to AA and is lower the closer the brace fastening is to the insulator; it is lowest when the metal braces make contact with the metal pins, with a steel crossarm, and when the metal pins are bonded. When insulators are over-stressed due to induced or surge voltages, or when they are faulty due to any cause, the discharge from conductors takes the shortest (or least insulated) paths through the pole to the ground. For a steel brace secured to (or not far from) the insulator pins, it is possible for both conductors to discharge at the same time through the two metal-braces in the same way as might be expected from a steel arm. But under the same conditions, the pole with the wood arm and braces, fig. 1(a) may only have a slight static discharge through a very high resistance path between insulators, with a maximum gradient for induced charges, *i.e.*, voltage per foot starting at the crossarm.

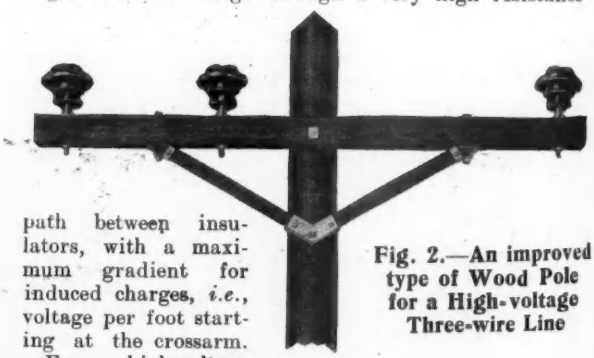


Fig. 2.—An improved type of Wood Pole for a High-voltage Three-wire Line

For a high-voltage line the " all wood " design shown in fig. 2 is commendable in many ways. It offers the following advantages: maximum pole and fitting insulation; a greater span-length, or maximum height of conductors above ground for a given pole-length; maximum potential gradient for the equivalent induced voltage charge; maximum reliability and performance from the operating standpoint; minimum transverse stress for equal weight, size and number of conductors; a relatively less unsightly line; and the cheapest wood-pole construction incorporating the most mechanical and electrical advantages, &c. The form of construction proposed in this article is not in accordance with the Regulations of the Electricity Commissioners for overhead-line construction, but it is suggested that when alterations are made the conditions might be borne in mind.

Small Domestic Appliances

The use of revenue-earning apparatus of the type described will be more widely spread where the confidence of consumers is secured by a well organised system of maintenance

By A CONSUMERS' ENGINEER

A LARGE and increasing part of the revenue of supply undertakings is obtained from domestic appliances. This revenue is a profitable one, particularly when obtained from the smaller pieces such as irons and kettles. Cheapness is essential, and there is a great temptation to sell a low-priced article merely for the sake of effecting a sale, and to overlook the real function of the appliance and the need for it to remain in service as current-consuming apparatus. Departmental stores are perhaps the biggest offenders in this respect. This is regrettable, especially at the present time when we are experiencing something of a boom in the smaller or artisan class of consumer, for if they are supplied with articles which need repair in a comparatively short space of time, they get the impression that electrical appliances in general are unreliable and are deterred from going further.

It seems worth while, therefore, to consider what appliances can be obtained at present, how far they are really suitable for their respective purposes, and what steps should be taken to ensure as far as possible that they remain suitable for such purposes.

Cookers, washboilers, kettles, and electric fires have already been dealt with in previous articles,* and it is intended here to deal chiefly with small appliances which can be obtained at relatively low cost.

The Indispensable Iron

The iron has been proved to be the best possible agent for propaganda purposes and to be the starting point of almost all household electrification.

The first irons were made as nearly as possible like the old "flat iron," in size, weight, and sole temperature, and force had to be applied to propel them over the clothes because of their rough sole surfaces.

When the electric iron with its smoother sole came into use it went over the clothes more easily and less force was required. In order to compensate for the reduced vertical component of that force, additional weight had to be put into the iron itself in order to get the same pressing effect. At the same time, the iron, by moving more rapidly, covered a greater area in a given time, and therefore gave up its heat more quickly, necessitating an increase in its loading as well as in its weight. The present standard is five and a half pounds weight and 550 watts loading.

Work is still not fast enough and there is a demand for a still heavier iron with thermostatic control. In the first of such irons available the mistake was made of making the sole temperature the same as that of the ordinary iron. That is to say its sole temperature was not increased sufficiently to compensate for the greater speed of working made possible, and consequently its heat recuperation was slow. This is now being remedied, and the thermostatic iron of six and a half to seven lb. weight loaded to 700 or 800 watts will in the future become standard.

Women do not yet realise how the electric iron has progressively revolutionised the ironing process. Those who regarded themselves as slow ironers did so because they could not supply the necessary energy to push a comparatively rough iron along. A heavy hot iron, with a bright sole does not need the exertion, and speeding up results unconsciously.

Ironing machines are gaining ground very rapidly, particularly in those houses where four or more persons have to be catered for. For all straight work, such as sheets, curtains, and napery, they are ideal, and can be obtained at prices which, when the work they can do is considered, are low. They can be obtained as an attachment to the washing machine.

* Elec. Rev. Dec. 27th, 1929; Feb. 21st, Mar. 28th and May 2nd, 1930; and April 10th, 1931.

Toasters and Coffee Percolators

Despite the criticism of Sir Frank Heath, who has by now been sufficiently castigated, electric toasters make excellent toast. They have an advantage over competitors, in that they can be used on the breakfast table. There are many good toasters to choose from and only a few bad ones. The bad are those in which the element is run at too high a temperature and with the bread too near it, though there are also a few with exactly the opposite fault. Generally these toasters are made by firms who are not regular manufacturers of electrical appliances, and they are made so because the high "apparent" heat is attractive to inexperienced buyers, making them easy to sell. The temperature of the spiral and the distance of the bread from it should be such that the toast is made in about one and a half minutes. Bread should be a day old if "bought" and two or three days if "home made," and should be half an inch thick.

The worst features of present-day toasters are: first, they are troublesome things to keep clean; secondly, the bread racks or holders are too shallow to take half-inch slices; and, thirdly, the elements are not easy to replace when occasion arises. Those designed expressly to overcome the latter defect have not been too successful, due to too light an element frame having been used, which has become buckled by heat by the time one wants to remove it. The only thing done so far to meet the first objection, has been the provision of a removable crumb tray. This helps, but it does not do away with the numerous corners and crevices where a polishing cloth cannot be persuaded to go. Who will be first with an enamelled toaster, of plain construction from which the element can be easily removed so that the toaster body can be immersed in water and washed? It is easily possible and should be as cheap if not cheaper to make than present-day nickel plated ones.

The "turnover" feature on most toasters is good, but on some it is spoiled by foolish knobs, which cause one to scorch one's fingers—the very thing they are really supposed to obviate. Toasters doing both sides at once need a high loading, and are not really necessary except where large families have to be catered for at breakfast. Incidentally they are the very thing for café work, particularly when the toast is ejected and current cut off automatically.

A toaster on the table in spring and autumn will often give a sufficient sensation of warmth to the face and hands to avoid the necessity of other heat in the breakfast room. This is a point of which much might be made, though it is very difficult to get a consumer to believe it until he has actually tried it.

An electric percolator makes coffee no better and no worse than any other, but it makes it more easily. A percolator is a thing in which to *make* coffee, not one in which to *keep* it when made. A recent criticism of this appliance was probably due to the coffee having stood for some time in the metal container and would have been the same with any metal percolator however heated. There is room for a percolator made of some material other than metal, but there is considerable difficulty in producing it without making it too bulky and heavy.

Warming Plates and Breakfast Cookers

These are not as popular as they ought to be. The reasons are two-fold. First, when supplied with a flat surface on which dishes make contact over the greater part of their under side, they get too hot, and when supplied with a hammered surface the dishes only make contact at a few points and do not get hot enough; a top of a rough matt nature, but which can be easily cleaned, is wanted. Secondly, they are too high in price

to meet a general demand. I would like to see plates of this nature fitted with a cover, either removable or hinged. They would necessarily be a little dearer, but would I think be better value for money, and could be put to many uses.

All such plates should have three-heat regulation. Unfortunately this feature has been dropped from those which used to have it, presumably to get the price down. They should also have heat insulated feet.

Breakfast cookers are at present rather out of favour. With the large increase in the number of small houses wired, there should be a revival. In this type of house there is usually only one really heavy cooked meal—at the week end—and that is done in the kitchen range. A breakfast cooker for use as such, and also for boiling potatoes and stewing, would meet the requirements for all other days of the week. They need only be in the plainest finish, but must be of robust design, and, so made, their maintenance cost will be small. They and their circuits would have to be hired.

Table grills and chafing dishes are very useful in "bachelor" flats, but so far have been regarded as "lampholder" appliances, the loading of which has been restricted to about 650 watts. At that loading they are not nearly as useful as they would be with 1,000 watts. The E.D.A. campaign for more plug points should open up a field for this class of apparatus loaded to 1,000 or 1,200 watts. They must, however, be more robust and more easily cleaned than those which have been available hitherto. The remarks regarding toasters and their cleaning applies to these appliances also perhaps to a more marked degree, as the class of people likely to use them have least time, and often still less inclination, to clean anything with inaccessable corners in which crumbs, fat, and dust can collect.

Utensils such as milk warmers, poringers, &c., in which the element is incorporated in the body will never be popular. They are more efficient than hotplates and somewhat quicker, but they cannot be immersed in water for cleaning purposes. Electric kettles or any appliances in which only water is boiled do not need cleaning as do those used for cooking purposes. With improvement in hotplate or boiling-ring performance self-contained utensils, except kettles, will disappear. The kettle will remain as a convenient portable means of boiling water.

Towel Rails and Clothes Driers

Where the hot water storage cylinder is normally placed in the bathroom, a heated towel rail is not a necessity (though still an advantage), unless the cylinder is lagged. Where the cylinder is placed elsewhere than in the bathroom, an electrically-heated rail has advantages over any other. Hot-water towel rails have the great disadvantage that, when they are most needed, the hot water in the system has already been run off for baths and the rail is cold.

The greatest difficulty is in finding space to fix them. Types which are fixed to the floor are necessarily ruled out in nine cases out of ten because there is not sufficient space available. Many attempts have been made to produce a good cheap wall-type rail, and there are a number now available, though they are not as cheap as one would like them to be. They have, however, too great a projection from the wall in most cases, and all of them are open to the objection that they dry only a small part of the towel area. What is wanted is a rail having three rods or tubes, fixed in the form of an inverted isosceles triangle, the lower tube being heated and fixed about twelve inches below the upper two, which should be four to five inches apart, with a total projection from the wall of not more than six inches. When a towel is hung over such a rail an air trap is formed, which will have the effect of drying about two feet six inches of towel. The rail must have four fixing points, which can be provided by means of two triangular end frames, with projecting arms carried out to the wall, with feet turned inwards or outwards carrying the fixing holes. The diameter of the lower tube should be such that with a length of about two feet six inches, and a loading of about 120 watts, the temperature does not reach "scorching" point if things are hung on it, as they will be sometimes, instead of over the top two rails.

In modern houses where floor space, especially in the kitchen, is so limited, the drying and airing of clothes is a problem, particularly in winter. A drying cupboard can be fixed in larger houses, but even there it is a waste of space as it permanently occupies floor area. In smaller houses portable appliances must be used to meet the situation, and a simple and effective method is to stand a fan behind a radiator, blowing the warm air along the clothes, which should be hung on a line or better still a wooden rack; the fan should blow the damp laden air towards an open window. Drying by this means is another instance of work which can only be done electrically. Nothing else can supply the air current, and no other type of heater can be used.

Airing does not need so much air movement as drying does. There are good portable airing racks available, though unfortunately not of British make. If there is a cupboard into which an "air warmer" can be fixed for use when required, this makes the cheapest and most satisfactory all-round arrangement.

Sundry Useful Heaters

Unfortunately or otherwise (depending on one's neighbours), pianos are rather out of fashion. This is all the more reason why some care should be taken to keep them in good condition. The chief requirement is to avoid moisture due to changes of atmospheric temperature. There are several types of warmer available, all reasonable in price and of low loading. They are but little known and would be welcomed by hundreds of consumers at present if they were aware of them. Their load factor is high, and many of them would be used at ordinary lighting rates, but they are neglected because their energy consumption is individually insignificant.

There are many types of small immersion heaters of low loading which are easily portable. Avoid any which have not a handle offering a hand-hold clear of leading-in wires and any which will permit water, when boiling, to splash into live parts.

Immersion heaters are very handy for heating small quantities of water for shaving and similar purposes. If required for milk or similar liquids the surface loading must be low, or burning will result. It is better in such cases to use one of normal loading to heat water in an outer vessel surrounding that containing the other liquid. The result is as quick and there is no risk of burning the milk.

There are dozens of uses to which these heaters can be put. Their one weakness is their liability to burn out quickly if not immersed. Photographers will find them useful for warming their solutions.

Curling tongs with heaters incorporated have been sold in great numbers, but they do not remain in service: the attached flexible impedes free movement. Heaters into which ordinary tongs can be inserted are a better proposition; they have the additional advantage that they can be used for other purposes. Goffering irons could be heated (if any goffering is done nowadays), and there are several little operations in decorative cookery where they are useful.

Bed warmers have undergone several metamorphoses before arriving at their present state of perfection. In the thermostatically controlled pads and blankets of today, there is not much, if any, room for improvement. There is, however, a field for a cheaper type, similar to some of the earlier ones, which generally consisted of a wooden framework with a carbon lamp or lamps, but the wood warped and the lamps broke. Something on similar lines, made up in aluminium with a low-loaded tube or strip heater, would find a demand if reasonably priced. It is unnecessary that it should compete in price with the hot-water bottle. A rubber bottle will not last long unless carefully looked after, and a stone one will drop only once as a rule before it breaks. Both are prone to leak and neither will retain a constant temperature. This particularly from a medical point of view makes the electric bedwarmer pre-eminent. The only warning needed is against use in damp situations, as when a patient is perspiring freely.

The E.A.W. London Conference

More trained women needed in home-service departments; the work of the Association in promoting rural electrification.

REFERENCE was made in our leading columns last week to the one-day Conference of the Electrical Association for Women, which was held on Friday, April 17th, at the Park Lane Hotel, London, W. The retiring president, Mrs. Wilfrid Ashley, took the chair. The formal election of the new officers, whose names were also given by us last week, took place, Lady Moir, O.B.E., being appointed president and the Dowager Lady Swaythling, hon. treasurer (in succession to Mrs. Ll. B. Atkinson). Mrs. S. Z. de Ferranti and Councillor Mrs. Gregory agreed to serve again as chairman and vice-chairman, respectively. New members elected to the Council include Mrs. J. H. Parker, Mrs. Pender Chalmers (representing aviation), and Miss Dorothy Vaughan.

Lady Moir is a founder member of the Association and a past-president of the Women's Engineering Society. Her interest in engineering was aroused during the war when she was one of the organisers of week-end relief work, she herself working the week-end shift and being a successful lathe operator for eighteen months. Her husband, Sir Ernest Moir, Bt., is one of the leading civil engineers of the day and he is also a director of Callender's Cable & Construction Co., Ltd. During her year of office Lady Moir intends to pay particular attention to the training and employment of women as electrical advisers to home-makers.

Madame Yevonde] *[London*

Lady Moir, O.B.E., President

The accompanying photograph of Mrs. de Ferranti with two of her grandchildren (the children of Mr. V. Z. de Ferranti), taken at her electrically-equipped dairy farm at Upper Basildon, near Pangbourne, is particularly appropriate in view of the active work of the E.A.W. in promoting rural electrification. Incidentally, we believe this to be the first occasion on which the portrait of the young Sebastian de Ferranti has appeared in an engineering journal.

The sixth annual report was adopted. Among many items of interest it contains a reference to the enterprise and initiative shown by the officers of the 25 branches throughout the country. While the Association works on a general policy, each branch is free to develop its activities in whatever way seems best locally, which has enabled many branches to develop new and interesting activities.

A considerable amount of time is taken up at headquarters in answering electrical queries from members, women's organisations, women decorators, house builders, architects, &c., and the Association has been able to render considerable assistance in thus acting as liaison officer between the public which wants electrical information, apparatus and service, and the electrical industry.

Apart from the more formal business dealt with, the principal item on the agenda was the passing of the following resolution: "That we, the members of the Electrical Association for Women, desire to place on record our belief that electrical development on the domestic side would progress with greater rapidity over the whole country if a larger number of trained women were employed in connection with home service departments, and we desire to urge the need for this policy on the electrical industry as a whole."

The necessity was also emphasised for the provision of suitable training in electrical housecraft in colleges and polytechnics. Another resolution related to the desirability of having an inner circle of women working in the industry. Reference was also made to the International Conference to be held in Glasgow in June, provisional details of which are given later.

The Social Functions

At the luncheon which followed, Sir Douglas Newton, K.B.E., M.P., spoke on "Electricity for the Countrywoman." The pertinacity of Sir Douglas in advancing the claims of rural dwellers during the committee stage of the Bill which became the 1926 Act adds weight to the belief he expressed that there were no members of the community who had more to gain from electricity than the husbandman and his wife. Of the 400,000 agricultural holdings in England and Wales, he said that 258,000 were between one and 50 acres and that there were 700,000 employés in agriculture. Every effort should be made to arrest rural depopulation by securing for countrymen the advantages which hitherto had been confined to urban inhabitants. Electricity would be found invaluable to the dairy, poultry farm, and in many other ways, and the help of the E.A.W. would be indispensable. He suggested that financial assistance should be provided for the construction of lower-voltage lines in proportion to that given for the main grid lines.

Mrs. M. Wintringham (Central Agricultural Board) referred to the close collaboration in daily work of the agriculturalist and his wife which differentiated them from the townsman. It was therefore just as important to electrify within as without the farm house. The Women's Institutes had been eager to co-operate with the E.A.W., which could give information on how to obtain electricity, what to do with it, and what it would cost. She suggested a survey throughout the country of what was now being spent on non-electrical lighting and heating as a basis for comparison.

Sir John Brooke, C.B. (vice-chairman, Electricity Commissioners), proposed the toast of the "Electrical Association for Women" as one of the most important and efficient bodies in the electrical industry. He referred to the remarkable foresight shown by the former Minister of Transport, the Rt. Hon. Wilfrid Ashley, himself a practical agriculturalist, in his idea of the Bedford demonstration area. His successor, the Rt. Hon. Herbert Morrison had followed with Norwich and was looking for other suitable areas. In 1930 over 1,000 miles of transmission lines had been constructed and 56,000 consumers obtained by undertakings. In regard to overhead construction, we could not be the only country which gave rural supplies without it.

Mrs. Wilfrid Ashley, responding, said that although retiring from the office of president (which she had held for

Mrs. S. Z. de Ferranti, Chairman

three years of the six years of the Association's existence), she would still serve it in any way she could. She believed that pylons would not be regarded as objectionable when people had become accustomed to them and drew attention to the excellent model of a grid line on the table in front of her that had been constructed in sugar by the chef of the Park Lane Hotel. She hoped that the result of the floodlighting demonstrations on public buildings next autumn would be that the method would become a permanent feature on the lines now adopted by Lord Ashfield and Mr. Selfridge for their buildings. It was necessary that architects and builders should learn the women's point of view, more especially in regard to the smallest and cheapest houses.

The annual ball of the E.A.W. has come to be regarded as one of the best organised events of the London electrical "season," as it certainly is among the most brilliant. Upwards of 250 people attended and quite evidently the function was enjoyed by the guests as much as its promoters could have wished or desired.

The following list of distinguished people attending the luncheon in addition to the speakers referred to above will give an indication of the widespread interest taken in the work of the Association :—

Lady Newton, the Rt. Hon. Herbert Morrison, M.P., P.C., and Mrs. Morrison, Major-General Sir Philip and Lady Nash, Sir Hugo and Lady Hirst, Mr. Vincent de Ferranti, Lady Moir, O.B.E., the Lady Belhaven and Stenton, Lady Snell, Colonel R. E. Crompton, C.B., R.E., Lord Elibank, Mr. and Mrs. Llewelyn B. Atkinson, Mr. W. McClelland, Lady Watson, the Dowager Lady Swaythling, Lady Trustram Eve (National Council of Women), Madame Van Waveren Resink (Holland), Mr. and Mrs. Massingberd Rogers, Mr. and Mrs. Frank Hodges, Mr. W. W. Lackie, Mr. H. C. Hazel (president, E.C.A.), Mr. A. J. Fuller (president, I.M.E.A.), Mr. C. C. Paterson (president, I.E.E.) and Mrs. Paterson, Mr. P. F. Rowell, Mr. and Mrs. T. P. Wilmshurst, Mr. and Mrs. Sully, Mr. Alex. Cramb (director, E.D.A.) and Mrs. Cramb, Mrs. S. Z. de Ferranti, Councillor Mrs. Gregory, Miss E. H. Pratt (Ministry of Agriculture and Fisheries), and Miss Caroline Haslett, C.B.E. (Director, Electrical Association for Women).

The Dowager Lady Swaythling, Hon. Treasurer

Second International Conference

The preliminary programme of the Second International Conference, which is to be held in Glasgow on June 3rd, 4th, and 5th, provides for the following arrangements :—

June 3rd.—Registration of delegates and (in the evening) an informal reception in Central Hotel, after which a mock trial will be presented by the Manchester and Salford Branch.

June 4th. *Morning.*—Opening ceremony in Royal Technical College, George Street (open to the public). Papers on electrical education will be read by women delegates from overseas, including Mademoiselle Paulette Bernege, France. *Afternoon.*—Visit to Stonybyres hydro-electric power station of the Clyde Valley Electric Power Co. *Evening.*—Civic reception by the Lord Provost, Magistrates, and Corporation of Glasgow.

June 5th. *Morning.*—Business meetings at the Royal Technical College. *Afternoon.*—Visits to the Kelvin Hall Civic and Empire-Week Exhibition and Dalmarnock generating station, or (alternatively) Messrs. Yarrow & Co., Ltd., shipbuilding yard, Scotstoun. *Evening.*—Dinner by invitation of the Glasgow and District Branch (Central Hotel).

June 6th.—Motor tour to Edinburgh, continuing to "Elibank," the residence of Viscountess Elibank (president of the Edinburgh Branch of the E.A.W.), thereafter running to the Border country and back to Glasgow; or sail on the River Clyde to Rothesay, where a visit will be paid to the generating station of Rothesay Corporation; or visit by coach, train, and steamer to the Trossachs, Loch Katrine, and Loch Lomond.

The Conference fee of £1 1s. includes invitations to the informal reception on June 3rd, luncheon, visit, and reception on June 4th, and luncheon, visit, and dinner on June 5th.

A number of small rooms have been provisionally reserved at the Central Hotel, Glasgow (9s. and 10s. per night, room only), applications for which must be sent to the E.A.W. (46, Kensington Court, W.8), *not later than May 13th.*

It is expected that a sufficient number of members will attend the Conference to enable cheap railway tickets to be obtainable.

Further Notes on the Annual General Meeting

As a tribute to the late Mrs. Hammer, an appreciative resolution was passed, the members standing for a few moments in silence.

The adoption of the annual report was proposed by Mrs. H. C. Lamb (Manchester) and seconded by the Dowager Lady Swaythling. The financial statement and balance sheet was presented by Mrs. Llewelyn B. Atkinson. Their adoption was proposed by Miss G. Sharp, and seconded by Mrs. Morley New (Cardiff).

The re-election of the Council was proposed by Mrs. Flack, and seconded by Mrs. Seward (S.W. Middlesex). The vote of thanks to the retiring officers was proposed by Mrs. S. Z. de Ferranti, and seconded by Lady Snell, who thanked Mrs. Wilfrid Ashley and Mrs. Llewelyn B. Atkinson, retiring at the end of their three years' term of office, for all that they had done for the Association. The election of the new officers was proposed by Councillor Mrs. Gregory and seconded by the Lady Belhaven and Stenton. The re-election of the chairman and the vice-chairman, and the auditors, and the election of Mrs. Wintringham as vice-president, was proposed by Mrs. Bentham and seconded by Mrs. Southam. The principal resolution referred to in the foregoing article, was proposed by Lady Moir, and seconded by Miss D. Vaughan.

Miss Kennedy, of the Glasgow Branch, gave a report of the arrangements which are being made for the Glasgow Conference in June, and the Director reported that a Swedish lady, Madame M. Silfverhielm, of the National Housewives Association, would read a paper.

Swaine]

Miss Dorothy Vaughan

[London Yeoman & Co]

Mrs. J. H. Parker

[West Hartlepool Fayer]

Mrs. Pender Chalmers

[Vienna

Book Reviews

Photo Cells and Their Application. By V. K. Zworykin and E. D. Wilson. Pp. xi+209; figs. 98. London: Chapman and Hall. Price 12s. 6d. net.

"Photo Cells and Their Application" provides a good deal of up-to-date information, and Dr. Zworykin's name in connection with photo-electricity is sufficient guarantee of the value of the text. A short introduction deals with the evolution of the first practical cells from Hertz's discovery in 1887, and not only the mechanical features of photo-cells, but the general method of their preparation is given. The original cells, as is well known, were of the vacuum type, but for all purposes where more liberal energy is required, gas-filled cells have taken their place. The authors give a useful chapter on the gas-filled cell, dealing with its kinetic theory, ionisation phenomena, and its response at various voltages, &c.

Three chapters are devoted to the application of the photo cell in talking-film practice, facsimile transmission, and television. In the latter chapter one would perhaps have been glad of more detailed practical information.

A chapter on amplification is included which gives useful information on simple and multi-stage d.c. circuits, the screen-grid tube, inductance coupling for audio-frequency amplification with a carrier, and radio frequency amplification. The subject of self-oscillating cells of the four-electrode type is touched on in this chapter. One especial feature of the book is the very liberal number of illustrations and diagrams.

All too brief is the chapter on applications of the photo cell, and it could be wished that in a future edition some details useful to the practical physicist on such subjects as spectro-photometry, the estimation of precipitates, and other laboratory practice could be included. Excellent bibliography helps to make this book indispensable to those using photo-electric cells.

The Law Relating to Industry. By H. Samuels, M.A., Barrister-at-Law. Pp. xvii+241. London: Sir Isaac Pitman & Sons, Ltd. Price 15s. net.

In this book the author has endeavoured to compress within a manageable compass those portions of the English law which concern the relationship between employer and employé. An intimate acquaintance with the needs of those directing industrial and commercial firms has enabled Mr. Samuels to know just what information is likely to be required and his work will prove an invaluable guide to directors, company secretaries, labour managers and business men generally. Among the subjects covered are the obligations and laws concerning apprenticeship and wages; employers' liability and workmen's compensation; trade unions and trade associations; the contract of employment; conditions of work in factories, workshops and mines; national insurance of employés; schemes of co-operation and voluntary welfare; and the conciliation and settlement of disputes. In addition to an excellently compiled general index there is a table of the large number of industrial law cases mentioned in the text.

Communication Networks, Vol. 1. By E. A. Guillemin. Pp. xii+422; figs. 145. London: Chapman & Hall. Price 25s. net.

In this treatise the author has developed the general theory of the electric circuit with non-distributed capacity and inductance. It is understood that a second volume is in preparation in which the Classical theory of lines, cables and filters will be dealt with. The author's treatment is entirely theoretical, and the subject is not illustrated with reference to practical problems. The book must therefore be regarded rather as a treatise on applied mathematics than on electrical technology. Throughout the work the author has endeavoured to include, rather than to avoid difficulties, and his explanation of the applications of advanced mathematical analysis to electrical problems are worthy of the highest praise. Those who have had a good grounding in mathematics, and who have a natural taste and aptitude for this subject, will, without doubt, derive pleasure and instruction from a study of Dr. Guillemin's book.

Considerable stress is laid upon the exponential notation for complex quantities, and a noteworthy feature of the book is the prominence given by the author to geometrical illustrations of results obtained by analysis, not only for steady state conditions with harmonic voltages, but also for transient states. The practical uses of determinants in advanced electrical calculations is very clearly explained. A further interesting point noted in perusing this book was the very lucid geometrical illustration of Taylor's theorem, and its application to the approximate solution of equations. The author explains very clearly what is involved in the solution of a differential equation, from the engineer's point of view, and he deals fully with the important matter of the determination of integration constants. There is a fair selection of worked-out numerical examples in the text, and each chapter concludes with a number of problems for solution by the student. The answers to these problems are not given. The value of the book to the student would, we consider, have been enhanced had the author included a bibliography, giving references to papers dealing with practical problems bearing on the subject matter of the book.

While the appeal of Dr. Guillemin's work will necessarily be somewhat limited, it can be recommended without reserve to those within the scope of this appeal, who desire to attain to a thorough knowledge of the applications of advanced mathematical analysis to electrical problems. When the work is completed by the appearance of the remaining volume it will form an outstanding contribution to scientific literature.

The T.S.S. "Rangatira"

Launched from the naval construction works of Vickers-Armstrongs, Ltd., Barrow-in-Furness, on April 16th, the twin-screw steam turbo-electrically propelled *Rangatira* has been built for the Union Steamship Co., of New Zealand, Ltd., and is intended for service between Lyttelton and Wellington, N.Z.

The ship will have five decks and accommodation is to be provided for about 720 first saloon passengers (some 600 in cabins and the remainder in public rooms) and 236 second saloon passengers (170 in cabins and 66 in public rooms), while the crew will total about 112. The vessel's principal dimensions are: length 400 ft., breadth 58 ft., depth 29 ft., load draft 17 ft., and her maximum speed will be 21.5 knots. Ventilation throughout is to be on the "Thermotank" system and each cargo hold will be served by two steel derricks and two electric winches. An electric windlass and capstan will be fitted forward and twin electric capstans aft for mooring purposes. Electric-hydraulic steering gear, with telemotor control from the bridge, is to be placed on the lower deck aft and a bow rudder has been fitted forward for manœuvring purposes, with similar type steering gear.

The main propelling machinery will consist of two separate turbo-alternators, each with its own condensing plant and auxiliaries, two double-unit synchronous motors coupled direct to the twin propeller shafts, a contactor cubicle to control the power the alternators will supply to the propulsion motors, and two balancer booster sets for excitation purposes. The ratings of the machines will be as follows: two B.T.-H. impulse-type turbo-alternator sets, each of 5,120 kW, 3,080 r.p.m., 3,150 volts, 3 phase, maximum, and two motors, each of 6,500 s.h.p., 220 r.p.m., 3,150 volts, 3 phase.

Isolators are to be provided at the forward end of the control cubicle to enable each alternator to be electrically connected to its respective propeller motor, or either of the alternators to be connected to both motors. Provision is also to be made at the forward end of the cubicle to enable one half unit of each propeller motor to be isolated when running on one turbo-alternator set. Controls will be so interlocked that damage cannot be done to any portion of the equipment when manœuvring by an unskilled operator. At the same time indicating instruments are to be provided by means of which an operator will be able to carry out orders in a very short space of time with the minimum of manual effort. For each propeller there will be a direction lever, field lever, and speed-controlling lever for varying the speed of the turbine, all mechanically interlocked to ensure correct operation. The whole of the control cubicle is to be "mistake proof" and the special keys will make incorrect switching impossible; for example, to open or close an isolator it will be essential to have all the levers in their "off" positions.

For supplying all the auxiliary, lighting, and cooking loads three B.T.-H. 350-kW, 220-volt, geared combined condenser turbo-generator sets are to be installed.

The two main condensers of the Weir regenerative type will have a total cooling surface of 13,500 sq. ft., sufficient to maintain a vacuum of 28½ in. of mercury with a sea temperature of 70 deg. F.

The steam generating installation will consist of six Yarrow high-pressure water-tube boilers of the five-drum, single-flow, front-fired type, fitted with superheaters and tubular air heaters. Steam will be generated at 400 lb. per sq. in. and superheated to 725 deg. F. The total boiler surface will be about 27,600 sq. ft., superheater surface about 9,000 sq. ft., and the total area of the tubular air heaters about 27,648 sq. ft. The boilers are to burn oil only under the forced-draught air-duct system, air being supplied by six electrically-driven fans of the Howden double-inlet type against a pressure of 6 in. w.g.

The oil-fuel installation will comprise two duplex units, electrically-driven, one working and one standby set, one simplex unit being provided for harbour purposes with a steam-driven pump. Other auxiliary machinery will consist of four main and two auxiliary electrically-driven circulating pumps, electrically-driven extraction pumps for the main and also for the auxiliary closed-feed systems, main-feed pumps of the Weir turbo-driven type, and standby feed pumps of the Weir steam-driven direct-acting type.

Surface heaters are to be fitted for raising the temperature of the feed water, one low pressure, one intermediate pressure, and one high pressure, heating steam being taken from the auxiliary exhaust system and bled at suitable pressures from the main turbines. A boiler evaporating plant will comprise one Wyndham heater and high-pressure evaporator with a distiller, and one low-pressure evaporator for supplying double distilled make-up feed water. A fresh-water distilling plant is also to be provided, consisting of two separators, two distillers, and two filters, each set capable of supplying 2,000 gallons of fresh water per 24 hours. The remaining auxiliaries are to be electrically driven also.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Shop-lighting Campaign

The British Electrical Development Association has published the final report on the Shop and Display Lighting Campaign which it conducted jointly with the Electric Lamp Manufacturers' Association in September and October last. The campaign was inaugurated as a result of a wide survey showing that only 25 per cent. of the shops inspected had effective interior lighting, while less than one per cent. had satisfactory external lighting. As a commencement, a campaign programme was circulated to the electrical trade with a booklet for the use of sales representatives and showroom staffs. Subsequently a conference of E.D.A. area officers was held and this was followed by area conferences in a number of leading cities, at which the details of the campaign were explained by Messrs. C. W. Sully, W. J. Jones, and V. W. Dale. A mailing list embracing 200,000 shops was compiled and a number of publications were sent to each, with the result that 3,606 inquiries were received and followed up. A further survey of 16,711 shops provided further useful information for future use. A series of advertisements was inserted in 42 national retail trade journals and the publication of a considerable number of articles was secured. Shop-lighting competitions were organised in 27 towns, a specially-designed trophy being awarded to the first prize winners in each case. A total of 77 lectures were delivered to appropriate audiences by members of the staff of the Lighting Service Bureau, and a travelling exhibition of electric signs, arranged with the co-operation of the Master Sign Makers' Association, visited about 50 towns in all parts of the country. As one of the results of the campaign eleven new E.D.A. Circles came into existence. The Campaign arrangements were in the hands of an executive committee of which Lt.-Col. W. A. Vignoles was chairman and Major H. Richardson deputy-chairman, and two sub-committees dealing with publicity and sales. These committees were composed of representatives of the two organising bodies and of the Electrical Contractors' Association (Mr. L. C. Penwill). Mr. C. Pinkham (G.E.C.) was co-opted upon the publicity sub-committee.

Expressing its satisfaction with the results, the executive committee states that it confidently anticipates later reactions and cumulative results in accordance with the general experience obtained in similar campaigns which have been organised in this country and in other parts of the world.

A " Holophane " Conference

On April 15th HOLOPHANE, LTD., arranged a conference of representatives of a number of municipal electricity and lighting departments. Over 60 attended and listened to lectures on various phases of " Holophane " development by members of the staff and others. The proceedings concluded with a dinner at the Criterion Restaurant.

Trade with Siam

A confidential memorandum regarding the appointment of agents, and the terms and methods of payment prevailing in relation to business with Siam, prepared by the British Consul-General at Bangkok, has been received and issued by the Department of Overseas Trade to firms whose names are on its Special Register. A copy of this memorandum can be obtained on application to the Department, 35, Old Queen Street, S.W.1. (Reference: C.X. 3504.)

Mr. Morrison at Bristol

At Bristol on April 10th, Mr. Herbert Morrison, the Minister of Transport, addressed the fifth of the series of conferences of representatives of electricity supply authorities which he has convened in various parts of the country. The proceedings at the earlier conferences—in London, Manchester, Glasgow, and Leeds—were reported in our issues of January 30th and February 6th. The Minister's opening speech closely followed the lines of those at the previous meetings and was an appeal to electricity undertakings to actively stimulate the growth of the use of electricity. He urged them not to wait for a demand but proceed ahead of the immediate requirements as a means of helping to revive trade and industry. Reference was made to the provision of suitable tariffs and the institution of assisted-wiring and hire-purchase schemes. The principal speakers in the ensuing discussion were Alderman Gough (Cardiff) and Mr. A. Nichols Moore (Newport).

Bristol and a Sales Engineer

The report of the Bristol Electricity Committee, which came up for consideration by the City Council on April 14th, contained a recommendation that a sales engineer should be appointed at a salary of £900, rising to £1,000 per annum. Mr. J. H. Inskip said that the Department's distribution system had increased five-fold and they were unable to obtain a sufficient number of consumers to provide an adequate load. Bristol was alone among the larger cities in not having a sales engineer. They could only cheapen the supply by selling more energy and the only way of doing this was to have an efficient sales organisation. The recommendation was opposed, one member stating that the local members of the Electrical Contractors' Association were willing to co-operate to stimulate the demand for electricity. In replying, Mr. Inskip said that the contractors had not been able to help. The Committee had friendly relations with the contractors and had no intention of doing the installation work. A sales engineer was a necessity; if the Committee's wildest dreams were realised the demand could be met by the existing station. A proposal that the matter should be referred back to the Committee was accepted by 32 votes to 12.

Floodlighting in Bradford Pageant

The floodlighting of principal buildings and street illuminations are proposed as part of the features of Bradford's Historical Pageant, which will be held from July 10th to 18th, and the Pageant committees are inviting the Corporation Electricity Committee to help by providing the illuminations as a gift. The British Electrical Development Association has undertaken to assist in the direction of prizes for Pageant Week shop window displays.

Russian Aluminium Purchases

Apart from the 9,000 tons of aluminium which the Soviet authorities recently purchased in Norway, it is stated that the European Aluminium Syndicate has now arranged for the sale of 6,000 tons to these authorities for h.p. mains. German, French, Swiss and English members of the syndicate are said to be participating in this delivery.

Registered Electrical Contractors

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Ramsbottom, H., Bury.
Holloway, E., Stoke-on-Trent.
Harris, F. W., & Co., Ltd., Leek, Staffs.
Painter & Madew, Ltd., Hanley, Stoke-on-Trent.
Gibson & Cossins, Pickering, Yorks.
Linnell, C., Burslem, Stoke-on-Trent.
Walker & Wileman, Burton-on-Trent.
Barrow, A., Bury.
Mansell Jarrett Co., Blackfriars, S.E.
Pearce, J., & Co., Manchester.
Walsall Electrical Co., Ltd., Walsall.
Spensers (London), Ltd., London, W.2.
Stott, James, & Sons, Ltd., Liverpool.
Shields & Marshall, Portsmouth.
Hobbs, C. J., & Co., Portsmouth.
Burton, G. H., Boston.
Wolf, E., & Co., Southsea.
Hampshire Electrical Co., Gosport.

At the same meeting five applications were withdrawn and 12 were declined.

The annual meeting of the National Register is to be held to-day (Friday) at the Institution of Electrical Engineers, at 2.30 p.m. A summary of the report and a note on the proceedings at the meeting will appear in our next issue.

New Zealand's Electrical Imports

The preliminary figures of external trade during 1930, just published by the New Zealand Government, show that although there was a decline in imports as a whole there were increases in imports of electrical machinery and equipment (from £1,596,095 to £1,722,376) and telephone apparatus (from £390,756 to £460,948).

Swedish Trade and Industry

The official *Swedish Economic Review* for March states that economic conditions in Sweden were fairly satisfactory up to the summer of 1930, but from June onwards signs of a decrease in production and sales and an increase in unemployment presented themselves more clearly. At first the export industries were chiefly affected. During the autumn industries working for the home market began to feel the effect of strained economic conditions, but at the end of the year the position of these industries was, on the whole, better than that of the export trade. Foreign trade declined in value in comparison with 1929, the exports being markedly lower. The electro-mechanical industry continued to occupy a favoured position during the last quarter of 1930, even though a certain weakness could be discerned here and there. In spite of the general decrease, electrical exports during 1930 showed an advance upon the preceding year's trade. Shipments of electrical machines rose in value from 32.504 000 kr. (£1,800,000 approx.) in 1929 to 34,351.000 kr. (£1,887,000) in 1930. Exports of telephone and telegraph apparatus increased from 14,148,000 kr. (£770,000) to 15,554,000 kr. (£855,000).

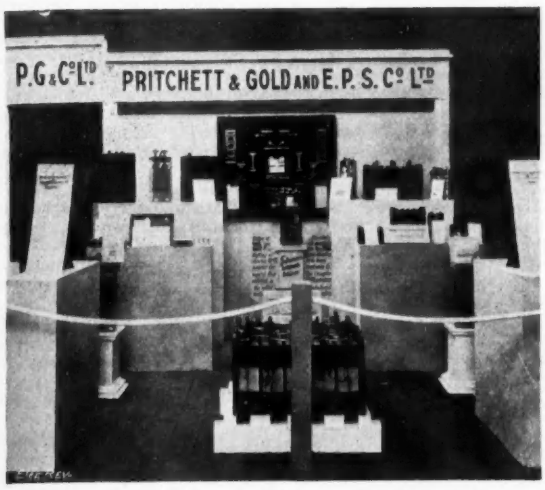
Local Exhibitions

A special demonstration of domestic and industrial electric cooking, organised by the borough electrical engineer of Southend-on-Sea, Mr. A. C. Johnson, was opened at the cooking centre, Victoria Circus, on April 20th, and continued until April 24th. There were demonstrations of cooking apparatus for schools, hospitals and hotels.

Under the auspices of the Central Sussex Electricity, Ltd., an exhibition was held at Haywards Heath last week, and was opened by Sir Henry S. Cautley, K.C., M.P.

Pritchett & Gold at Buenos Aires

We reproduce herewith a photograph of another electrical stand at the British Empire Trade Exhibition, Buenos Aires, which comes to a close on Monday next. It is that of PRITCHETT & GOLD & E.P.S. Co., LTD. In the centre are



The Pritchett & Gold Stand, Buenos Aires

examples of the company's nickel-iron train-lighting cells, while, in addition to a number of smaller models, the construction of the cells is illustrated by a board bearing components at the back of the stand.

The Chinese Machinery Market

In the course of a recent report to the Department of Overseas Trade, the British Commercial Counsellor at Shanghai says that it is as a potential market for machinery and engineering supplies that South China offers the most favourable prospects for British manufacturers, and both in Hong Kong and Canton he has heard of many inquiries being received for electrical and other plant. In his conversations with Chinese merchants at Canton, whilst they showed little interest in other departments of the import trade there were constant references to the necessity for the development of Chinese industries, and hopes were expressed that British assistance would be forthcoming in the form of the supply of machinery on terms of extended credit. Apart from private enterprises, municipal improvements, railway and road construction, conservancy works, water supply and electric power schemes are all under consideration, and the resumption of work on the Southern section of the Hankow-Canton Railway has led to a revival of interest in the development of valuable mining areas which have hitherto been lacking in transport facilities. The most ambitious scheme at present being considered is for the installation of a hydro-electric power station at Yingtak, about 100 miles from Canton, which is estimated to cost about $10,000 000 (gold), but no negotiations for carrying the scheme into effect have yet been started, it appears. "In this, as in other engineering and industrial schemes in China, finance presents the greatest difficulty, especially in view of the present exchange position, for neither the Government nor private interests can find the capital required for the purchase of expensive imported machinery, and business is rarely possible except on terms of deferred payments. Still, there can be no doubt as to the existence of the demand, and in some cases at least the financial difficulties should not be insurmountable, so that one cannot but feel that South China is deserving of more attention than it is at present receiving as a possible market for British machinery."

Employment during March

The April *Ministry of Labour Gazette* states that employment in the engineering industry remained bad during March and showed a decline for the sixteenth successive month. The number of unemployed on March 23rd was 247,948, the proportion being 24.4 per cent. (against 12.0 per cent. in March, 1930). In the electrical section 13,696 unemployed were recorded, or 15.2 per cent. of the total number of insured persons (against 6.0 per cent.). There were 15,714 unemployed in the cable, wire and lamp manufacturing group—15.3 per cent. against 7.5 per cent. in March last year. In the electrical wiring and contracting industry the number of unemployed was 2,903 (15.7 per cent., against 9.2 per cent.).

Cables at Building Exhibition

The Cable Makers Association is responsible for an interesting display of electric cables at the Manchester Building Trades Exhibition which opened on April 14th and concludes to-morrow (Saturday). Specimens of the types of cable in most popular use are displayed in showcases but there are also coils of heavy cables such as those used for street mains, factories and for power transmission purposes. Rubber insulated cables in single core, concentric and multicore types with various metallic and non-metallic protective covering are to be seen. In view of the attention that is now being given by contractors to electrical house-wiring systems, it is appropriate that there should be a neat display of suitable wiring systems both in conduit and protected surface wiring.

Wages in the Engineering Industry

A further conference was held in London last week between representatives of the Engineering and Allied Employers' Federation and engineering trade unions. The union representatives were to report the results of the meeting to their executives yesterday (Thursday). The matters under discussion are the employers' proposals to lengthen the working week from 47 to 48 hours, to revise overtime and night-shift rates, to institute a three-shift system, and to extend payments by results.

Domestic Electrification in Exeter

An interesting little booklet has been prepared by the Exeter Corporation Electricity Department to bring to the notice of its consumers the numerous applications of electricity for domestic purposes. Illustrations are given of some of the electrical appliances which may be hired from the Department, together with a table showing the various operations a kWh of electricity can be made to perform. Besides particulars of the "all-in" tariff and the assisted-wiring scheme, there are a number of useful hints on such subjects as cleaning lamps and shades, reading meters, and the use of portable appliances. A list of electricity charges is appended.

E.D.A. Activities

The Sales and Publicity Programme of the British Electrical Development Association for May includes two new features, one being a special local advertising service under which the Association is prepared to undertake the preparation of special advertisement campaigns for any members. It is not proposed to make a service charge when Eda standard blocks are used. The other feature is a special refrigeration window display for May, shown in the accompanying illustration, which is designed for windows with open backs. This is in addition to the usual monthly window display for closed-type windows which, for May, also has a refrigerator as the central feature. In view of the fact that so many shops and showrooms now have windows of the open type, the Association's displays will, in future, be adapted accordingly. The remainder of the programme contains all the usual monthly features, including

The E.D.A. May Window Display

national advertising schemes, further particulars regarding the Electric Homes Campaign, and a price list of the month's posters and literature. Copies of the Association's annual report are now available to members. A booklet (report No. E.D.A. 915) has been published dealing with the use of ultra violet rays.

The Radio Wholesalers' Federation

Mr. E. W. Houghton, chairman of the Council, presided at the third annual meeting of the Radio Wholesalers' Federation on April 15th. The organisation now has a membership of 60 and further applications are being considered. It was stated that relations with other trade organisations continued to be of a cordial character and that much work had been done to prevent wholesale and retail price-cutting. During

the year new branch sections were formed with headquarters at Leeds (North Midlands) and Bristol (South Western). In proposing the adoption of the report, Mr. Houghton said that manufacturers were increasingly consulting the Federation both upon the terms of their agreements as affecting wholesalers and as to the status of applicants for wholesalers' terms. At the luncheon which preceded the meeting the chairman's health was proposed by Mr. A. G. Beaver, the hon. treasurer, who paid a glowing tribute to Mr. Houghton's work on behalf of the Federation.

Trade Announcements

The telephone number of the Southall works and offices of the LORIVAL MANUFACTURING CO. (1921), LTD., has been changed to Southall 1014 (2 lines).

The Leeds branch of the LIVERPOOL ELECTRIC CABLE CO., LTD., the LONDON ELECTRIC WIRE COMPANY & SMITHS, LTD., and F. SMITH & CO., has been removed to 40, York Place, Leeds.

The CARWIN ELECTRIC CO. opened new showrooms, works, and offices at 45 and 47, Corporation Street, Preston, on April 18th.

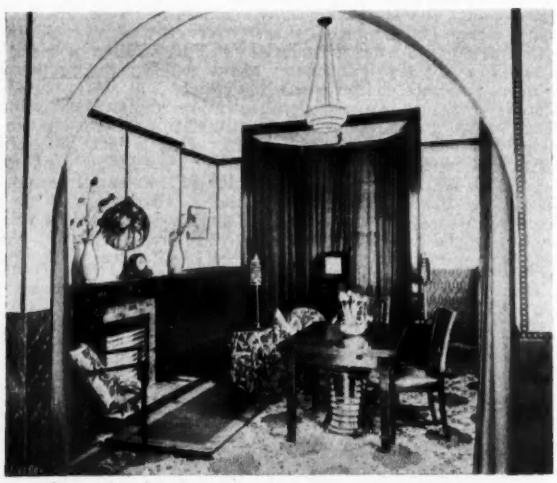
The KIDDERMINSTER & DISTRICT ELECTRIC LIGHTING CO. opened new offices and showrooms at 4, Vicar Street, on April 13th.

MR. W. H. STANGER, electrical contractor, Spalding, has removed his business to new premises at 20, New Road.

Messrs. O'BRIEN & CO. are removing from 66, Mosley Street, to 78, George Street, Manchester, where they will trade in future under the title of O'BRIEN & HULME. Manufacturers' catalogues, lists and terms are asked for, as existing matter was destroyed by fire recently.

New Cardiff Showrooms

The accompanying illustration shows one of the apartments of the new showrooms recently opened at 20, Windsor Place, Cardiff, by the BRITISH ELECTRIC TRANSFORMER CO., LTD. The room illustrated is a model dining room in which are demonstrated "Tricity Sunray" radiators. The adjoining rooms contain a comprehensive display of electric toasters, kettles,



The "Tricity" Showrooms, Cardiff

irons, boilers, and other domestic appliances; direct heat, reflector, and imitation-coal type electric fires, further models of "Sunray" radiators, and a representative range of "Kye" lamps. A special demonstration kitchen has been arranged to house the various types of "Tricity" combination cookers. To inaugurate the opening of the showrooms a "Sunray" week was held from April 13th to 18th, a special invitation to visit the premises being sent to about 5,000 residents. The new showroom is in charge of Mr. Norman Tegetmeier, district manager for the company.

Bankruptcy Proceedings

H. COWEN, wireless retailer, 24, Bayer Street, Golden Lane, and late of 51, Farringdon Road, E.C.—The first meeting of creditors under this failure was held on April 16th in Bankruptcy Buildings, Carey Street, W.C. No statement of affairs was submitted and it appeared that he had not attended on the Official Receiver for his preliminary examination. The receiving order was made on March 31st on the petition of A. J. Stevens & Co. (1914), Ltd., Wolverhampton, the act of bankruptcy alleged being non-compliance with the requirements of a statutory bankruptcy notice. His present whereabouts were unknown. Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., was appointed trustee of the estate.

S. E. RICHARDS & A. K. NEILSON (Richards & Neilson), wireless and electrical engineers, 182, Tulse Hill, S.W.2.—Discharge suspended for three months to June 17th, 1931.

D. W. MORPHY, wireless apparatus manufacturer, 14, Collinette Road Putney, S.W.—Last day for receiving proofs for dividend, May 22nd. Trustee, Mr. E. Parke, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

J. T. Lord, Commercial Buildings, Oakworth, near Keighley, Yorks., electrical engineer and contractor.—The first meeting of creditors in this matter was held on April 14th at the Official Receiver's office, Bradford. The debtor's statement of affairs disclosed gross liabilities of £394, with ranking liabilities of £390, and a deficiency of £200. The failure was stated to have been due to "insufficiency of capital, depression in trade, and ill-health." The case being a summary one was left in the hands of the Official Receiver, as trustee.

H. A. ATACK, electrician and wireless accessories dealer, 442, Borough Road, Birkenhead.—Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver, released, March 16th.

W. V. OWEN, electrical engineer, 1, Church Street, Tremadoc.—First and final dividend of 2s. 4d. in the £, payable May 1st, at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

Company Liquidations

FELLOWS MANUFACTURING CO., LTD., Park Royal, N.W.—The report of Mr. J. Barwick Thompson, Official Receiver and liquidator, upon the compulsory liquidation of this company, has been issued, together with a summary of the statement of affairs showing liabilities of £120,693, against assets of £61,813, and a total deficiency of £189,049 with regard to contributories. The company was formed in July, 1927, to acquire the assets and business of the "Magneto Company" and to take over the liabilities of that company under a scheme of reconstruction. The company's general objects were to carry on the business of manufacturers and vendors of radio apparatus, automobile electricians and ignition specialists. It is evident from the information given in the deficiency account filed with the statement of affairs that the business was carried on latterly at a heavy loss. Debentures have been issued at various times and at the date of the winding up order £58,493 was due to the bondholders, on whose behalf Mr. P. A. Bristow had been appointed receiver. The latter had realised certain of the assets and it appears that there is no prospect of any surplus becoming available to meet the claims of the unsecured creditors (£59,651) or to enable any return of capital to be made to the shareholders. The failure of the company is attributed by the directors and the secretary to various causes, which are summarised as follows:—Insufficient working capital at the commencement; mistaken policy of dealing direct with the public which necessitated too heavy an expense in advertising (it is stated that this policy also brought about strong opposition in the trade to the company's products); unfavourable results of a hire-purchase system; and inefficient management on the part of the former managing director. In the opinion of the Official Receiver the failure is attributable to mismanagement on the part of the directors in that the working capital provided was totally inadequate to finance the ambitious and expensive programme on which they caused the company to embark.

HOMEALITIES, LTD., Sheffield.—Meeting, May 18th, to receive an account of the winding up of the company by the liquidator.

ANDERSON'S WIRELESS SALES AGENCY, LTD.—Meeting, May 18th, to receive an account of the winding up by the liquidator.

CELESTION, LTD.—Winding up voluntarily for reconstruction purposes. Liquidators, Mr. C. French, Celestion Works, London Road, Kingston-on-Thames, and Mr. C. R. Akers, 1, Queen Victoria Street, E.C.

RADIO ELECTRIC CO. (BOURNEMOUTH), LTD.—Last day for proofs for dividend, May 5th. Liquidator, Mr. J. L. Wilkinson, Official Receiver, Midland Bank Chambers, High Street, Southampton.

PELICAN ELECTRIC, LTD.—Winding up. Liquidator, Mr. J. J. Reid, 94, Old Broad Street, E.C.2.

Private Arrangements

T. & C. BAILEY, trading as "Baileys," electrical engineers, 56, Dyke Road, Brighton.—A statement of affairs was submitted at a creditors' meeting recently, showing liabilities of £1,893 and net assets of £394, leaving a deficiency of £1,499. The business was established about eight or nine years ago, with practically no working capital. No figures had been prepared prior to March, 1927, but at that date for a period of five months the trading disclosed a small loss of £24. Further accounts disclosed a loss of £600, exclusive of the drawings of the debtors. It was decided that the debtor should be requested to execute a deed of assignment in favour of Mr. W. A. J. Osborne (Corfield & Cripwell), Balfour House, Finsbury Pavement, E.C., as trustee, with a committee of inspection.

G. C. WRIGHT, St. Helens Road, Swansea, electrical and wireless dealer.—At a recent meeting of creditors a statement of affairs was submitted showing liabilities of £2,124 and net assets of £922, leaving a deficiency of £1,202. It was reported that the debtor commenced as an agent for various firms in 1927. He attributed his present position to the giving up of commission agencies in order to take larger discounts in the wholesale business. During the year to March 31st, 1930, his turnover was £3,440, and the commissions had been £680. There was a net loss of £30. In the following 12 months there was a loss of £100 on a turnover of £9,020. The creditors decided that the debtor should be requested to execute a deed of assignment in favour of Mr. S. E. Clutterbuck, Swansea, as trustee, and to appoint a committee of inspection.

J. H. GATH, trading as the Gath Electrical Co., Halifax.—The trustee under the deed of arrangement in this matter (Mr. E. Sproat, 45-47, Commercial Street, Halifax) reports

that the winding up of the estate cannot be completed until the debtor receives commission on certain contracts which are being carried out.

New Catalogues and Lists

MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2.—An attractive folder relating to the 1931 "Orgola" kit radio sets.

The MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, London, W.1.—The second of a new series of service publications dealing with the "Model 560" a.c. radio receiver. Also a showcard and window poster prepared for use in the company's sales campaign in connection with the opening of the North Regional station.

The EQUIPMENT AND ENGINEERING CO., LTD., 2 and 3, Norfolk Street, Strand, W.C.2.—A circular illustrating various types of "Simplex" jacks.

The SAXONIA ELECTRICAL WIRE CO., LTD., Roan Works, Greenwich, S.E.10.—List No. 31931, relating to flexible cords, cables, &c.

The GENERAL VEHICLE CO., LTD., 15, Devonshire Street, London, E.C.2.—An illustrated booklet describing a wide range of "G.V." electric commercial vehicles.

WILLIAM GEIPEL, LTD., Vulcan Works, London, S.E.1.—A brochure giving details of splices and tapes for rubber-insulated wires.

L. G. HAWKINS & CO., LTD., 30/35, Drury Lane, London, W.C.2.—A special Ideal Home Exhibition number of "The Link."

B.E.N. PATENTS, LTD., 92, Tottenham Court Road, London, W.1.—A folder giving particulars of a new and improved "B.E.N." automatic tyre inflator.

The WALKER ELECTRICAL SERVICE, Annandale Street, Edinburgh.—An illustrated folder describing the "Walker" electrical plant maintenance service.

The MERSEY CABLE WORKS, LTD., Linacre Lane, Bootle, Liverpool.—List No. 15, giving prices of "Mersey" rubber-insulated cables and flexibles.

The EQUIPMENT & ENGINEERING CO., LTD., 2 and 3, Norfolk Street, Strand, London, W.C.2.—A leaflet dealing with the "Eco" double-jet hot-air hand dryer and revolving head vices.

HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—The April issue of the "Wigan Review," giving particulars of "Wigan" flameproof oil-immersed triple-pole thermal type circuit-breakers and flameproof enclosures.

The ENGLISH ELECTRIC CO., LTD., Stafford.—Two interesting publications dealing with "English Electric" automatic substations and the standardisation of supply frequency on the North-East Coast.

C. H. BYRON & CO., Beakes Road, Bearwood, Smethwick.—A 118-page catalogue illustrating the company's extensive range of electric bell pushes in brass and bakelite mouldings, electrical contacts, burglar and fire alarms, &c.

The EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, London, E.C.4.—Publication A.636, setting forth in detail the advantages of "Ediswan" quick-make and quick-break switches.

FALK STADELMANN & CO., LTD., 83-93, Farringdon Road, London, E.C.1.—A coloured brochure dealing with panel-type lighting fittings for attachment to 1¼-in. shade carrier lampholders.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.—A net price booklet (No. 23) of "Henley" cables and wires. Also details of list adjustments and trade discounts applicable to rubber-insulated wires, cables and flexible cords.

J. H. HOLMES & CO., LTD., Hebburn-on-Tyne.—Pamphlet No. 821, giving particulars of "Castle" class "M" low-centre induction motors.

A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—Three leaflets dealing respectively with earthing, electrically-heated drying ovens, and immersion-type water-heaters for steam-raising.

CAPEL & CO., LTD., XL Engine Works, Colchester.—List sheet "X," describing "Excelite" country house lighting plant, generating sets and switchboards. Also sheet "S.G." relating to "XL" vertical engines and pumping sets.

The AUTOCAR ELECTRICAL EQUIPMENT CO., LTD., 32-34, Albert Embankment, London.—A revised price list of automobile electrical equipment. Also an announcement of the extension of service until midnight.

The "Z" ELECTRIC LAMP & SUPPLIES CO., LTD., 73, Newman Street, Oxford Street, London, W.1.—A leaflet illustrating a wide range of portable and transportable radio receivers.

Book Notices

"South African Mining and Engineering Year Book." Pp. clvi+490. London: Argus South African Newspapers, Ltd. Price 22s. 6d. post free.—The 1931 edition is profusely illustrated and includes large maps of South African mining fields. An alphabetical list is given of the principal engineering concerns in the Union of South Africa, Rhodesia, &c., and an important feature is the revised and amended list giving particulars of over 2,600 overseas manufacturers represented in South Africa, with names of local representatives. The publication is one which will be found of inestimable value to British engineering concerns interested in the development of Overseas trade.

"A Laboratory Manual of Electrochemistry," by Dr. Erich Müller and H. J. T. Ellingham. Pp. xiv+363; figs. 88. London: George Routledge & Sons, Ltd. Price 15s. net.

"Electricity for Everybody: Handbook for 1931," by R. Borlase Matthews. Pp. lxxxvii+469; illustrated. London: The Electrical Press, Ltd. Price 5s. net.

Recent Contracts

Messrs. PETTERS, LTD., are supplying Marconi's Wireless Telegraph Co., Ltd., with eleven oil-engine driven electric generating sets for the power equipment of wireless stations at the order of the King of Hedjaz and Nejd, which will provide Arabia with a complete system of telegraphic communication. Two of these sets consist each of a 12-b.h.p. Petter cold-starting surface-ignition crude fuel oil engine directly coupled to a 6-kW Electric Construction Co. generator, and the remaining nine sets comprise 3½-b.h.p. Petter "Universal" tank-cooled engines directly coupled to 1½-kW generators of the same make.

The Central Electricity Board has placed a contract valued at about £100,000 with the Pearson & Knowles Engineering Co., Ltd. (Lancashire Steel Corporation, Ltd.) for eight transmission-line towers in connection with the South-West England and South Wales, and the South-East England Electricity Schemes. Two which will be employed in the Thames crossing at Dagenham will be 500 ft. in height.

The British Broadcasting Corporation has placed an order with Messrs. CROSSLEY BROS., LTD., for four 350-b.h.p. vertical oil engines, which are to be installed in the new Scottish Regional Station at Falkirk. These engines represent the latest development in vertical compressorless Diesel engine design.

French Foreign Electrical Trade

The French imports and exports of electrical machinery, apparatus and goods during the past two years are shown in the appended tables. The values have been converted at an exchange rate of 125 francs to the £.

Imports:	1929. £	1930. £	Increase or decrease. £
Dynamo-electric machines and transformers	987,536	1,643,704	+ 706,168
Telegraph, telephone apparatus, &c. ...	2,156,376	2,457,472	+ 301,096
Dynamo and motor parts	2,560	18,656	+ 16,096
Incandescent lamps	806,256	884,104	+ 77,848
Arc lamps and parts	1,544	3,384	+ 1,840
Carbons for electric and industrial purposes	115,728	107,432	– 8,296
Electric wires and cables	598,496	845,424	– 253,072
Parts of electrical machinery and apparatus	225,088	359,768	+ 134,680
Magnets, other than electro-magnets ...	19,504	18,784	– 720
Accumulators and parts	73,192	75,192	+ 2,000
Dry batteries and condensers	25,064	53,568	+ 28,504
Porcelain and other insulators...	76,616	57,712	– 18,904
Total imports	£5,097,960	£6,025,200	+ £987,240

Exports:	1929. £	1930. £	Increase of decrease. £
Dynamo-electric machines and transformers	684,992	665,272	– 19,720
Telegraph, telephone apparatus, &c.... ...	1,181,832	1,478,688	+ 296,856
Dynamo and motor parts	8,880	1,624	– 2,256
Incandescent lamps	252,632	282,088	+ 29,456
Arc lamps and parts	12,072	10,072	– 2,000
Carbons for electric and industrial purposes	181,024	235,128	+ 54,104
Electric wires and cables	523,288	557,968	+ 34,680
Parts of electrical machinery and apparatus	325,328	403,072	+ 77,744
Magnets, other than electro-magnets ...	1,960	1,832	– 128
Accumulators and parts...	255,000	292,760	+ 37,760
Dry batteries and condensers	51,096	41,368	– 9,728
Porcelain and other insulators...	162,776	197,288	+ 34,512
Total exports	£3,635,880	£4,167,160	+ £531,280

It will be seen that there was a marked increase in the imports, the advance amounting to £987,240, or nearly 20 per cent. On the other hand there was an increase of only £531,280, or about 14½ per cent. in the exports.

New Australian Company

The Metropolitan Electric Co., Ltd., was recently registered in Sydney, N.S.W., with a capital of £10,000. Its objects are to manufacture and sell radio, telephone and electrical equipment.

For Sale

The London County Council invites tenders for the purchase, dismantling, and removal of one 5,000-kW turbo-alternator with condensing plant, &c., at present installed in the East Greenwich tramway power station.

A 2,000 kW rotary convertor and transformer, with starting panel switchgear, &c., is offered for sale by the Westminster Electric Supply Corporation, Ltd.

(See our advertisement pages to-day.)

Prices of Materials

Messrs. James Forster & Co. state that the decision of the principal lead producers to institute a "cut" of 15 per cent. in production caused a rise in the price of the metal last week. But after the subsidence of speculative buying and consumers' demand the price again sagged. A cut of 15 per cent. by the producers concerned means a reduction of 180,000 tons a year. The scheme, however, excludes the United States' domestic production and the Mount Isa mines, and it is estimated that stocks are increasing at a similar rate.

Messrs. Edward Till & Co. report, April 21st: India-rubber, Para fine, 4½d., ½d. dec.

Messrs. James & Shakespeare report, April 21st: Copper bars (best selected), sheet and rod, £75, £2 dec. English pig lead, £14, 5s. dec.

Messrs. F. Smith & Co. report, April 21st: No change in the prices of electrolytic copper and silicium bronze wire.

Electricity Supply

Lighting, Domestic, Power

Aberfeldy (Perthshire).—ELECTRICITY SUPPLY SCHEME.—The Town Council has approved plans submitted by the Grampian Electricity Supply Co. for the supply of electricity in the town.

Aldershot.—NEW SHOWROOMS—The Town Council has decided to purchase premises at the corner of Station Road and Victoria Road for conversion into showrooms for the electricity undertaking.

Barnes.—REVISED TARIFF.—The Urban District Council has adopted the following revised scale of charges:—Lighting flat rate: 2¾d. per kWh. Two-part tariff for lighting, heating, and cooking: A fixed charge of 7½ per cent. per annum of the rateable value of residence, plus a "unit" charge of ¾d. in the summer quarters and 1d. in the winter quarters. Power: First 1,500 kWh per quarter, 1¼d. per kWh; beyond, 0.9d. per kWh. Water heating: ¾d. per kWh. Cinemas, where matinee performances are given daily: 2d. per kWh for all purposes. Shop display lighting after closing hours: 1d. per kWh. Unrestricted heating: 1¼d. per kWh. Shop heating: 1d. per kWh on condition all heating apparatus is switched off from dusk to 9 p.m. between October to March. Contract rate for private residences: 2d. per 20-watt lamp per week. Service rental: A quarterly charge from 1s. to 5s. Minimum quarterly charge (up to 78 kWh): 7s. 6d. per quarter, inclusive of 1s. for service rental.

Birkenhead.—EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £3.720 if an unemployment grant is obtainable. New mains and switchgear are also to be provided at a cost of £7,972 to cater for the increased load in the neighbourhood of Flaybrick Hill sub-station and for ventilating and lighting the Mersey Tunnel.

Bognor Regis.—PROPOSED PURCHASE OF UNDERTAKING.—The Urban District Council is investigating the question of purchasing the electricity undertaking from the Pognor Regis Gas and Electricity Co., Ltd., and has instructed a report to be prepared showing the price at which the undertaking could be purchased (*a*) as an economic proposition and (*b*) so that when the management was in the Council's hands, a reduction of charges could be made.

Bradford. — FLOODLIGHTING OF BUSY STREETS. — By an arrangement between the Corporation Watch and Electricity Committees, powerful electric floodlighting lamps have been erected at certain of the city's busy road junctions, concentrated particularly on the policeman on point duty. A scheme is also being contemplated by the Tramways Committee for large floodlighted indication signs at the city termini.

Brighton.—STREET LIGHTING SCHEME.—The Corporation Lighting Committee has approved a scheme costing £8,347 for the lighting of the main coast road from Marine Parade to Rottingdean.

ALL-ELECTRIC HOUSES.—At a recent meeting of the Corporation Health Committee the borough surveyor reported on the 64 houses to be erected on the Whitehawk estate. It was decided that the "all-electric" policy should be adopted on the same terms as those approved for the other 193 houses to be erected on the estate by the Housing Sub-Committee.

Canterbury.—LOAN SANCTIONED.—The City Council has received sanction to a loan of £6,800 for electricity purposes on account of £8,682 applied for.

Carlisle.—ASSISTED WIRING.—The Corporation Electricity Committee is applying for sanction to a loan of £5,000 in connection with the assisted-wiring scheme.

Continental.—GERMANY.—A return just to hand shows that the output of the 122 principal electric supply undertakings in Germany during January last only amounted to 1,357,200,000 kWh, as compared with 1,555,700,000 kWh in the corresponding month of 1930.

FRANCE.—La Société Auxiliaire d'Eclairage et de Force of Lyons has recently secured a concession to establish a hydro-electric power station to utilise the water of the Chatel Montagne falls on the river Besbre, near Mayet, in the Department of Allier. A concession has also been granted to a syndicate at Noiretable (Loire) to establish a plant to utilise certain falls on the River Couzon near Aubusson (Puy-de-Dome).

ITALY.—Official sanction has been received by the Società Italiana per l'Utilizzazione della Forze Idrauliche del Veneto, of Udine, to proceed with the erection of a 125,000-V transmission line between Nove and Canera. The Società Adriatica di Elettricita, of Ferrara, has also been authorised to erect a 50,000-V line between Codigori, Portomaggiore and Bologna.

SWITZERLAND.—*The Times Trade and Engineering Supplement* states that in view of the growing need of the Federal Railways for power for traction, it was decided at a recent meeting of the Board of Administration that the construction of a new power station at the Etzel, on the River Sihl, in the Canton Schwyz, should be started this summer. It is anticipated that the work will be concluded by the autumn of 1934. This new station will be erected by the Federal Railways in collaboration with the Nordostschweizerische Kraftwerke A.-G. The plant owned by the railways will comprise three single-phase generators coupled to turbines of 20,000 h.p., while the Nordostschweizerische Kraftwerke A.-G. will have three 3-phase generators coupled to turbines of 16,600 h.p. The cost is estimated at 62,000,000 Swiss francs (£2,480,000) and will be shared by the railways and the power company to the extent of 55 and 45 per cent. respectively.

Derby.—STREET LIGHTING.—The Corporation Electricity Committee has approved of the conversion of 75 gas lamps to electricity, and the installation of an additional 200 electric street lamps.

Dorchester.—POWER STATION EXTENSIONS.—The Corporation Lighting Committee has authorised the borough surveyor to carry out the necessary work of laying the foundations for new plant at the electricity works.

East Ham.—EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £4,133. A supply of electricity is also to be given to the Aldersbrook Homes at a cost of £2,904.

LOAN.—Sanction has been received to the borrowing of £4,574 for distributor mains in various streets, £4,758 for additional converting plant and switchgear for Church Road sub-station, £7,377 for laying new feeder cables in various streets and £4,846 for additional converting plant and switchgear.

Edinburgh.—REDUCED CHARGES FOR LARGE CONSUMERS.—A sub-committee of the Corporation General Utilities Committee is considering a scheme for reducing the cost of electricity for lighting and power for large consumers. It is expected that these consumers will benefit to the extent of about £31,000.

Garstang.—SUPPLY REQUIRED IN HAMBLEDON AND UPPER RAWCLIFFE.—The Rural District Council has received petitions from residents at Hambleton and Upper Rawcliffe for a supply of electricity, and has referred the matter for consideration to the Preston Corporation.

Leeds.—NEW TRANSFORMING PLANT.—The Corporation Electricity Committee has voted £25,000 for the provision of new transforming plant.

ASSISTED WIRING.—Sanction has been received to a loan of £30,000 in connection with the assisted-wiring scheme.

London.—IMPROVED STREET LIGHTING.—The Works Committee of the Camberwell Borough Council has been reconsidering the question of the installation of improved lighting in Dulwich Common and Thurlow Park Road and has decided to recommend the acceptance of a quotation by the County of London Electric Supply Co., Ltd., for a period of five years, subject to a lighting intensity being provided equal to not less than twenty times the existing lighting intensity.

ST. PANCRAS.—The Borough Council has received sanction to loans amounting to £14,100 for the extension of feeding and distributing mains.

FULHAM.—Subject to the approval of the Borough Council, the Electricity and Lighting Committee has decided upon a reduced schedule of prices for contracts with wiring contractors in connection with the domestic wiring scheme.

Mains extensions costing £550 are to be carried out in Sandelands Road and Purlington Road and Gardens.

SHOREDITCH.—The provision of new feeder cables from the Worship Street and Hearn Street sub-stations at a cost of £1,128 is recommended by the Borough Council Electricity Committee.

BATTERSEA.—The Borough Council Electricity Committee is to provide electricity services to 116 premises at an estimated cost of £1,102. The replacement of the old vulcanised bitumen distributors with armoured cable is also to be carried out in Vicarage Road at an estimated cost of £167.

HAMMERSMITH.—Sanction has been received by the Borough Council to a loan of £3,500 for the provision of reactances and switchgear in connection with bulk supply of electricity from the London and Home Counties Joint Electricity Authority.

STOKE NEWINGTON.—The Borough Council has received sanction to a loan of £5,000 for house wiring installations.

Lynn.—LOAN.—The Town Council is to apply for sanction to a loan of £15,000 for additional plant required for the electricity undertaking.

Middlesbrough.—AUTOMATIC TRAFFIC CONTROL.—Automatic traffic signals are being erected at important crossings in the town by the Corporation Electricity Department.

Nelson.—BULK SUPPLY.—The Corporation Electricity Committee has approved terms suggested by the Central Electricity Board for a bulk supply to Settle. A request from Salterforth for a supply of electricity has also been received.

Newcastle-upon-Tyne.—NO ELECTRICITY FOR FENHAM HOUSING ESTATE.—Although 75 per cent. of the residents are in favour of substituting electricity for gas, the Corporation Housing Committee has refused to grant permission for the introduction of electricity on Fenham housing estate because of the road digging which would be entailed. There are approximately 370 houses on the estate and it was stated that the residents had agreed to the electricity company's terms of 6d. per week on the charges for energy to pay off the cost of the installation.

POSTPONEMENT OF PURCHASE OF UNDERTAKING.—The Corporation Parliamentary Committee and the Newcastle-upon-Tyne Electric Supply Co., Ltd., have reached a provisional agreement in regard to the City Council's proposal to postpone for five years its option to purchase the city's electricity undertaking.

Northern Ireland.—BELFAST.—At the conclusion of the inquiry of the Northern Ireland Electricity Commissioners into the application of the Electricity Distribution Co., Ltd., for a Special Order to supply electricity in the counties of

Derry and Antrim, Mr. Monroe, K.C., speaking on behalf of the Distribution Company, stated that the company would rather have its application refused altogether than granted with the omission of Coleraine. Mr. Lowry, appearing for the Coleraine Borough Council, said that the Council was prepared even at that late stage to negotiate with the company for a bulk supply. He suggested that the Antrim Electricity Supply Co., Ltd., set out under false pretences, stating that it was going to generate electricity on the Bann; it had obtained its powers but had never cut a sod on the Bann. The Council itself could give a much more economic supply than the company. Closing the case for the applicants, Mr. Monroe said that the trend of modern development was for big scale distribution, and if they wished to keep abreast of the times the Order should be given to his clients who were in a position to provide a very excellent service. The inquiry was concluded.

THE ELECTRICITY SUPPLY BILL.—The Electricity (Supply) Bill, to which some fifty amendments have been put down, principally safeguarding the interests of local authorities, including the Belfast Corporation and existing electricity undertakings, has reached the Committee stage in the Northern Ireland House of Commons. The *Irish Times* says that the Belfast and Londonderry Corporations are seeking direct representation on the Advisory Committee, and consequently it is proposed to reduce the representation of the Association of Municipal Authorities from six to four. The electrical trade in Northern Ireland is offering strenuous opposition to certain clauses in the Electricity Bill, in particular those relating to the power of the Government to deal in electrical fittings and appliances.

Panama.—HYDRO-ELECTRIC DEVELOPMENT.—The *Manchester Guardian Commercial* states that tenders will be invited about the middle of the year for the construction of a hydro-electric power station on the Chagres River in the Panama Canal zone. The scheme involves the construction of a dam 220 ft. high and 1,200 ft. long.

Portsmouth.—MAINS EXTENSIONS.—The Corporation Electricity Committee has obtained sanction to the borrowing of £6,500 for the extension of mains to North Hayling, Hill Head, and Thorney Island. Permission has also been obtained to lay a submarine cable under Portscreek in order to give a supply of electricity to the Hilsea Ordnance Depôt.

ASSISTED WIRING.—A revision of the conditions of the assisted-wiring scheme is recommended by the Electricity Committee.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SLOUGH.—*Slough and Datchet Electric Supply Co., Ltd.*—Lighting flat rate: From 7d. to 6½d. per kWh.

WARRINGTON.—Domestic purposes other than lighting: From 1d. per kWh plus 50 per cent. to 1d. per kWh, with the usual discount.

Rhodesia.—THE LIVINGSTONE POWER PROPOSAL.—Speaking in the Northern Rhodesia Council, the Governor said that of three engineers' reports received on the proposed new power station for Livingstone, two maintained that the Victoria Falls hydro-electric scheme was not economic, but the third thought it might be made a sound proposition. In view of these conflicting opinions the question had been referred to British experts for a further report.

South Africa.—JOHANNESBURG.—The City Tramways and Lighting Committee recommends the borrowing of £500,000 for the provision of additional plant at the municipal power station, in spite of the advice of the Electricity Supply Commission to obtain outside quotations for the extra energy required.

Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order authorising William George Heath to supply electricity in the borough of Okehampton, the urban district of Tavistock, and the rural districts of Okehampton and Tavistock.

Sunderland.—MAINS EXTENSIONS.—Sanction to the borrowing of £15 000 for mains extensions has been received by the Town Council.

Swansea.—MAINS EXTENSIONS.—The Corporation Electricity Committee has decided to undertake the following extensions of mains: E.h.p. main from Heol-las sub-station to the old power house, Glais (£7,587); l.p. mains, &c., at Glais, Birchgrove, and Lonlas (£14,185); e.h.p. main from the generating station to the Mumbles sub-station *via* Sketty (£13,500); and an e.h.p. main from Gower Road to a new sub-station to be constructed at Bayswater Road.

Swindon.—CHANGE-OVER.—The Corporation Finance Committee recommends that application should be made for sanction to a loan of £10,000 for plant, land, &c., required in connection with the change-over of the system of supply from d.c. to a.c.

Walsall.—ASSISTED WIRING.—The Corporation Electricity Committee is to allocate £10,000 for installations under the wiring scheme.

Warrington.—LOAN.—The Corporation Electricity Committee is applying for sanction to a loan of £20,000 for mains and services.

Wigan.—MAINS EXTENSIONS.—The Corporation has decided to extend mains to give a supply of electricity in Gathurst.

Traction Notes

Continental.—ITALY.—Included in an extensive programme of the development of the State Railways is a scheme for the conversion from steam to electricity of 4,000 km. of trunk lines and 10,000 km. of track, mainly serving the provinces of Piedmont and Liguria.—*Reuter's Trade Service* (Milan).

BELGIUM.—During the past year about 68 miles of the local railway system of the Société Nationale des Chemins de Fer Vicinaux were converted to electric traction, bringing the total of the company's electrified system to approximately 488 miles. Work is at present in hand on the conversion of another 156 miles of line.

HOLLAND.—A trial trip has been made on the section of the Netherlands railways between Amsterdam and Alkmar which has been electrified by a German firm. Regular working is expected to be introduced shortly.

London.—CHEAP SUNDAY FARES.—"Twopence-all-the-way" fares on Sundays were re-introduced on London County Council tramcars this week and will operate throughout the summer The scheme was tried out experimentally during August, September, and October last and was considered satisfactory. The cheap Sunday fares are in operation all day after 4 a.m. and where practicable transfer facilities are given.

THROUGH-RUNNING AGREEMENT.—By a further through running agreement with the London United Tramways, Ltd., the London County Council No. 14 tramway service between London Bridge and Wandsworth was extended last week to Wimbledon Hill, *via* Summerstown and Haydons Road.

RAILLESS CARS.—It is expected that London's first railless-car service, which will run on the London United Tramways' route between Twickenham and Kingston Bridge, will be opened to the public next month. The service will later be extended to Tolworth and Wimbledon.

Newcastle-on-Tyne.—THE TRANSPORT QUESTION.—When the Northern Traffic Commissioners meet in Newcastle to-day (Friday) the London & North-Eastern Railway Co. will oppose the application of the Corporation for permission to run 'bus services on certain routes in the city, on the ground that the company's electric train service is quite adequate for the needs of the residents. The company points out that the granting of licences to run 'buses will only result in wasteful and extravagant competition between the two systems.

Scottish Tramway and Transport Association.—ANNUAL CONFERENCE.—The ninth annual conference of the Association is to be held at Aberfeldy on May 29th and 30th. The Taymouth Castle Hotel will be the headquarters.

Tynemouth.—TRAMWAY ABANDONMENT.—The Tynemouth and District Electric Traction Co., Ltd., reports that the experimental service of motor 'buses over the tramway route has proved very popular and negotiations are proceeding for the entire abandonment of the tramways at an early date.

Telegraph and Telephone

Australia.—RADIO-TELEPHONY.—The British Postmaster-General announces that the Anglo-Australian radio-telephone service, which has hitherto been restricted to a number of the larger towns in the Commonwealth, is now available to all parts of Queensland, New South Wales, Victoria, and South Australia. Calls from the Isle of Man and Northern Ireland are subject to an additional charge.

International Telephony.—POLAND-GERMANY.—In addition to the two telephone cables already in use between Warsaw and Berlin, *via* Posen, two new high-frequency aerial lines are shortly to be installed, each of which will allow of several conversations being carried on simultaneously. The extension of the service is necessitated not only by its increased use between the two countries, but also between Poland and Great Britain, France, Holland, &c.—*Reuter's Trade Service* (Warsaw).

Malacca.—TELEPHONY.—The transfer of all the subscribers connected to the telephone exchange at Malacca to a completely new and up-to-date system was recently successfully carried out without any serious interference with the service. Some 330 subscribers' lines, 11 junctions, and 4 trunks were simultaneously cut-over from the old to the new exchanges. The new equipment has a capacity of 500 subscribers' lines and all necessary inter-exchange lines and service facilities. The equipment and subscribers' instruments were supplied by the General Electric Co., Ltd., and installed by the engineers of the Posts and Telegraphs Department.

Russia.—AUTOMATIC TELEPHONY.—The first automatic telephone exchange in Russia has recently been completed with 6,000 connections in Rostov. Work is in hand on the establishment of five automatic stations in Moscow, with a total of 50,000 connections.

Sweden.—AUTOMATIC TELEPHONY.—A large automatic telephone exchange at the south end of Stockholm (Soeder), to serve 40,000 subscribers, has been opened. Many stations in different parts of Stockholm, which is one of the first towns in the world, if not the very first, as regards the number of telephone subscribers in proportion to the population, have now been reconstructed for automatic service.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—CALL OFFICES.—The number of public call boxes now in use totals 34,350, of which 10,040 (situated in public thoroughfares) are available for service at all hours of the day and night.

CONSETT EXCHANGE.—A modernised exchange was inaugurated on April 18th.

POLICE FACILITIES.—Wandsworth is the first division of the Metropolitan Police to be completely equipped with street call boxes, the whole of which came into operation on April 20th. The division covers an area of fifty square miles, and embraces the districts of Kingston, Putney, Richmond, Wimbledon, Malden, Barnes, Earlsfield, and Surbiton.

Brazil.—TELEGRAPH CONCESSIONS.—Under the terms of an official decree issued on April 20th, regulating the conditions for the operation of Brazilian telegraph services, the concessions for internal telegraphs at present enjoyed by companies which also own submarine cables will not be renewed.—*Reuter* (Rio de Janeiro).

Radio

Denmark.—INTERFERENCE LAW.—Parliament recently passed an Act which is framed to prevent radio "howling" and reception interference caused by all kinds of electrical apparatus. The proceeds from fines inflicted on breakers of the new law will accrue to the broadcasting organisation.

France.—FINANCE.—The Chamber and the Senate have voted a credit for 1931 of twenty million francs for the State broadcasting system, of which five millions will be utilised for buildings and fifteen millions for material and equipment. This is the first part of a programme which envisages the expenditure of sixty-five million francs for the same purpose, says *World-Radio*, which also announces that a public hall will shortly be opened in which a listener will be enabled to hear any of the principal European wireless concerts on payment of a small admission fee. The hall will be situated on one of the main boulevards.

North Regional Station.—FURTHER TESTS.—The B.B.C. announces that evidence now exists that north regional listeners are ready for an extension of the preliminary transmissions and that the new high-power station should radiate a portion of the north regional programme. On April 20th, therefore, the transmitter (on 479.2 metres, 626 kc/s) commenced to radiate the Manchester and Leeds programmes every weekday between approximately 4.0 and 5.15 p.m. and the late dance music from 10.30 or 11.0 p.m. till midnight every night. During these reception tests the Manchester transmitter will be shut down, as also will the relay transmitters at Bradford, Hull, Leeds, Liverpool, Sheffield, and Stoke-on-Trent.

Switzerland.—NEW STATION.—Following the inauguration of the Sottens station recently, a second high-power transmitter commenced testing on the night of April 20th.

Russia.—NEW STATIONS.—It is reported that the Soviet proposes to spend £10,000,000 on wireless broadcasting stations by 1932. The erection of twenty-two 100-kW stations is contemplated, and 133 smaller stations of from 1 kW to 100 kW are planned for installation during the next twelve months.

Wireless Exchanges.—NELSON.—The Nelson Town Council has been in communication with the Postmaster-General respecting the establishment of a municipal wireless exchange, and has been considering arrangements to be made to interview representatives of various firms and other persons who have already established wireless relay stations in the borough The Electricity Committee has been recommended to consider the sale of "all-mains" wireless receiving sets and essential component apparatus by means of its showroom.

CARDIFF.—Doubt having arisen whether the Corporation can grant a monopoly to one concern, the Municipal Public Works Committee has deferred its decision to allow a company to inaugurate a re-diffusion scheme under which the Corporation would receive 7½ per cent. of the gross takings from subscribers.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Armadale.—Town Council. Electric lighting for housing scheme. Schedules from the town clerk.

Australia.—MELBOURNE.—May 5th. Posts and Telegraphs Department. Instrument cords. (A.X. 10869.)*

June 9th. Plug seat switches. (A. 10876.)*

Bulgaria.—SOFIA.—April 30th. Telegraph and Telephone Authorities. 350,000 m. of rubber-insulated wire, 20,000 m. of underground telegraph cable, 75,000 kilos of bronze wire, and 250,000 kilos of galvanised iron wire. (A.X. 10874.)*

Capel.—April 30th. Tunbridge Wells, Tonbridge and Southborough Joint Hospitals Board. Installation of electric lighting at the Dislingbury Small-pox Hospital. Particulars from Mr. Frank Harris, engineer to the board, 48, Pembury Road, Tonbridge (deposit £1 1s.).

Eccles.—May 9th. Sewage Disposal Committee. Pumps and motors required in extension of sewage disposal works. Specification (contract No. 5) from the borough engineer and surveyor, Town Hall (deposit £1 1s.).

Egypt.—CAIRO.—June 8th. Ministry of the Interior. Supply and installation at Guirguch of power station (generator capacity approximately 500 kVA) and distribution system. (A.X. 10870.)*

Gainsborough.—Electricity Department. Cables and meters (April 10th.)

Lighting fittings for the Town Hall. (April 17th.)

Glasgow.—May 11th. Electricity Department. Cables and meters. (See this issue.)

Gravesend.—April 28th. Electricity Department. Water-tube boiler. (April 17th.)

Hastings.—May 8th. Electricity Department. Boiler fuel. (See this issue.)

Heston and Isleworth.—May 1st. Electricity Department. Cables. (April 17th.)

Hoyland.—May 10th. West Riding County Council. Electric lighting installation in several schools. Specifications from Mr. A. Rayner, 151, Cross Hill, Ecclesfield.

Ilkley (West Riding).—April 30th. County Council. Electric lighting installation and refrigerating plant at Middleton-in-Wharfedale Sanatorium. Particulars from the West Riding Architect, County Hall, Wakefield.

London.—CENTRAL ELECTRICITY BOARD.—April 27th. Metering equipment for certain stations in the area of the North-East England Electricity Scheme. (March 13th.)

April 27th. 132,000-V outdoor switchgear for the South-West England and South Wales Scheme. (March 20th.)

May 11th. Construction of central control station building at Park Street, Bankside, for the South-East England Electricity Scheme. (April 17th.)

May 18th. Central indicators and telephones for the Central England Electricity Scheme. (April 17th.)

May 27th. Site works, foundation works, and buildings at Northampton, Ironbridge, Wolverhampton, Stafford, and Stoke-on-Trent for Central England Electricity Scheme. (See this issue.)

OFFICE OF WORKS.—April 27th. Electric lamps. (April 17th.)

May 8th. Mechanical and engineering labour in the Newcastle-on-Tyne, Leeds, and Southampton districts. (See this issue.)

Manchester.—Electricity Department. May 6th. Cables. (See this issue.)

May 1st. Electricity Committee. Steel flue ducts for two boilers at Barton power station. Specification from Mr. H. C. Lamb, city electrical engineer and manager, Town Hall (deposit £1 1s.).

Middlesbrough.—May 6th. Electricity Department. Cables and meters. (See this issue.)

New Zealand.—WELLINGTON.—May 5th. Post and Telegraph Department. Telephone keys and magneto ringing bells. (A.X. 10877.)*

Norfolk.—May 2nd. County Council. Wiring and fittings for electric lighting at Swainsthorpe Institution. Particulars from Mr. C. J. Norton, architect, 9, Queen Street, Norwich (deposit £1 1s.).

Plymouth.—Two electric lifts at the City Hospital. Details from the steward, Mr. S. R. Henwood.

Portsmouth.—May 13th. Electricity Department. Cables. (See this issue.)

South Africa.—CAPE TOWN.—May 13th. Electricity Department. 6,000 yards of 3-core cable for 11,000 volts, and 13,000 yards of 4-core cable for 600 volts. (A.X. 10875.)*

PRETORIA.—May 22nd. Department of Posts and Telegraphs. 12 motor-driven ringing generators. (A.X. 10853.)*

Stoke-on-Trent.—May 13th. Electricity Department. A.c. meters. (See this issue.)

Switzerland.—BERNE.—May 13th. Swiss Federal Railways. Supply and erection at Rupperswill of a reserve 7,000-kW generating plant operated either by Diesel engines or steam turbines. Particulars (5 francs) from Abteilung für Elektrifizierung, Bureau No. 166, 43 Mittelstrasse, Berne. Tenders to General Direktion, Schweizer Bundesbahnen, Berne.

West Midlands.—Joint Electricity Authority. May 13th. 33,000-V overhead transmission lines, supported by steel towers. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Abbeyleix (Queen's Co.).—District Hospital Committee. Accepted :—
Installation of electric lighting at the District Hospital (£274).—Keatinge & Gaule.

Barking.—Electricity Committee. Recommended :—
L.p. cable (£729).—Ateliers de Constructions Electriques de Charleroi.

Birkenhead.—Corporation. Accepted :—
Transformers (£773).—Hackbridge Electric Construction Co., Ltd.
E.h.p. cable (£721).—W. T. Glover & Co., Ltd.
Switchgear.—Ferguson, Pailin, Ltd.; Allen West & Co., Ltd.; George Ellison, Ltd.

Canterbury.—City Council. Accepted :—
Installation of electric lighting and heating at public conveniences.—S. Orton.

Dundee.—Education Committee. Accepted :—
Electric lighting at new school in Bellfield Street (£542).—W. Stenson & Son.

East Ham.—Cleansing Committee. Recommended :—
Battery for electric vehicle (£200).—Chloride Electrical Storage Co., Ltd.

Edinburgh.—Town Council. Accepted :—
Transformers.—Bruce Peebles & Co., Ltd.

Falkirk.—B.B.C. Accepted :—
Four 350-b.h.p. vertical oil engines for the new Scottish Regional station.—Crossley Brothers, Ltd.

Glasgow.—Transport Committee. Accepted :—
Trolley wire. —Whitecross & Co., Ltd.; F. Smith & Co.

Government Contracts.—The following contracts were placed by the various Government Departments during March :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Batteries and cells.—London Battery & Cable Co., Ltd.
Submarine telephone cable.—Siemens Bros. & Co., Ltd.
One 1-ton electric travelling crane.—Wharton Crane & Hoist Co., Ltd.
One 10-ton and one 5-ton electric travelling cranes.—Vaughan Crane Co., Ltd.
One 3-ton electric travelling crane.—Sir William Arrol & Co., Ltd.
Dynamometers.—Heenan & Froude, Ltd.
Electric generating sets.—Arrol-Johnston & Aster, Ltd.
Electric lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Spare parts for lamps, &c.—Chadburn's (Ship) Telegraph Co., Ltd.
Motors and accessories.—General Electric Co., Ltd.
Ventilating fans.—Laurence, Scott & Electromotors, Ltd; Small Electric Motors, Ltd.; Veritys, Ltd.; General Electric Co., Ltd.

WAR OFFICE.
Generating sets.—Douglas Motors, Ltd.

AIR MINISTRY.
Control resistance and voltmeter.—Telephone Manufacturing Co. (1929), Ltd.
Electrical aircraft controls.—Williamson Manufacturing Co., Ltd.
Generators.—Haslam & Newton, Ltd.
Petrol-electric mobile crane.—Ransomes & Rapier, Ltd.
Receivers.—Radio Instruments, Ltd.

CROWN AGENTS FOR THE COLONIES.
Cable.—Callender's Cable and Construction Co., Ltd.
Electric hammer.—R. G. Ross & Son, Ltd.
Generating plant.—Ruston & Hornsby, Ltd.
Generator.—Lancashire Dynamo and Motor Co., Ltd.
Insulators.—Bullers, Ltd.
Meters.—Ferranti, Ltd.
Spares for "Lux" cells.—Chloride Electrical Storage Co., Ltd.
Static transformer.—British Thomson-Houston Co., Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
Wire.—British Insulated Cables, Ltd.; I.C.I. Metals, Ltd. (Elliot's Metal Co., Ltd.); Whitecross Co., Ltd.

GENERAL POST OFFICE.
Telephonic apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Joseph Sankey & Sons, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.
Cable.—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Erewash Electric Wire Co., Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Reliance Electrical Wire Co.; Standard Telephones and Cables, Ltd.
Loading coils.—General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Resistance coils.—Standard Telephones and Cables, Ltd.
Telephone cords.—British Insulated Cables, Ltd.; L.P.S. Electrical Co., Ltd.; Phœnix Telephone and Electric Works, Ltd.; Reliance Electrical Wire Co.; Standard Telephones and Cables, Ltd.
Insulators.—Doulton & Co., Ltd.
Rheostats.—*L.* W. Hart & Co.
Cable suspenders.—Siemens Bros. & Co., Ltd.
Transformers.—Ferranti, Ltd.; Standard Telephones and Cables, Ltd.
Thermionic valves.—General Electric Co., Ltd.; Standard Telephones and Cables, Ltd.
Flameproof wire.—British Insulated Cables, Ltd.
Telephone exchange equipment.—Castle Bromwich, Springfield (Birmingham area), and Ardwick (Manchester): Siemens Bros. & Co., Ltd. Park (Dundee multi-exchange area), Coventry, and Wordsworth (London automatic area): General Electric Co., Ltd. Sub-contractors for Wordsworth: D.P. Battery Co., Ltd., for batteries; Crompton Parkinson, Ltd., for charging and ringing machines. Bowes Park (London automatic area): General Electric Co., Ltd. Sub-contractors: Crompton Parkinson, Ltd., for ringing machines; D.P. Battery Co., Ltd., for batteries. Morris Commercial Cars, Ltd. (Smethwick): Relay Automatic Telephone Co., Ltd. London County Council (County Hall). York, Ipswich, and Newbury: Automatic Telephone Manufacturing Co., Ltd. Sub-contractors for Newbury: Electric Construction Co., Ltd., for motor generator set; Alton Battery Co., Ltd., for batteries. Wolverhampton, Finchfield, Bilston, Fallings Park, Penn, and Tettenhall (Wolverhampton multi-exchange area), and Valentine (London area): Standard Telephones and Cables, Ltd. Sub-contractors for Valentine: Crompton Parkinson, Ltd., for motor generator sets; Electric Construction Co., Ltd., for ringing machines; Hart Accumulator Co., Ltd., for batteries.
Telephonic repeater equipment (Hull and Nottingham).—Standard Telephones and Cables, Ltd.

H.M. OFFICE OF WORKS.
Wiring Broadmoor Asylum, Crowthorne.—A. Higginbotham & Sons.

Hull.—Corporation Tramways Department. Accepted :—
Part supply for 12 months.—Carbon and gasfilled lamps, cord grip shade carrier lampholders, and ceiling roses.—Edison Swan Electric Co., Ltd.

Kettering.—Electricity Department. Accepted :—
Supply for 12 months of e.h.p. and l.p. lead-covered cables.—Union Cable Co., Ltd.

Lamp Contracts.—The Port of London Authority has placed an order with the British Thomson-Houston Co., Ltd., for three months' supply of Mazda vacuum and gasfilled lamps. Siemens Electric lamps & Supplies, Ltd., have received a contract from Hull Corporation Tramways Department for one year's supply of traction lamps.

London. — ISLINGTON. — Electricity Committee. Recommended :—
Parts for grit extractors.—Davidson & Co., Ltd.
Installations under the wiring scheme.—M. J. T. Thomas and Co.; the prices range from 27s. 9d. per point for 3-light installations to 23s. per point for 12-light installations.

BATTERSEA.—Electricity Committee. Recommended :—
Extension to works power switchboard at generating station (£3,458).—General Electric Co., Ltd.
Accepted :—
Circulating water pump (£1,680).—Worthington-Simpson, Ltd.
750-kW motor convertor with automatic switchgear (£4,992).—General Electric Co., Ltd.

SHOREDITCH.—Electricity Committee. Recommended :—
Cable for 12 months.—Hackbridge Cable Co., Ltd.

HAMMERSMITH.—Electricity Committee. Recommended :—
Air-cooled transformers (£3,719), and two banks of Scott connected transformers, with one spare transformer (£2,057).—British Electric Transformer Co., Ltd.

CITY LAW COMMITTEE. Recommended :—
Re-wiring the Mayor's and City of London Courts (£416).—Electrical Installations, Ltd.

BERMONDSEY.—Electricity Committee. Recommended :—
D.c. switchboard at Almond Road sub-station (£415).—Crompton Parkinson, Ltd.

South Africa.—PORT ALFRED (CAPE PROVINCE).—Town Council. Accepted :—
Plant for the new electricity undertaking.—Engines, &c.—Hubert Davies & Co., Ltd.
Poles and wiring.—Stewarts & Lloyds, Ltd.

Warrington.—Electricity Committee. Accepted :—
Transformers. — British Thomson-Houston Co., Ltd.; Crompton Parkinson, Ltd.
Public Assistance Committee. Accepted :—
Automatic telephone installation at general hospital.—Automatic Telephone Manufacturing Co., Ltd.

Whitby.—Urban District Council. Accepted :—
Kiosk for the Sandsend extension scheme.—Yorkshire Switchgear & Engineering Co., Ltd.
Switchgear for St. Hilda's Terrace sub-station.—Crompton Parkinson, Ltd.

Worcestershire.—Education Committee. Accepted :—
Installation of electric lighting at Crabbe Street school, Wollescote (£120).—T. R. Priest.

Forthcoming Events

BIRMINGHAM ELECTRIC CLUB.—Friday, April 24th. Grand Hotel, Birmingham. 7 p.m. "The Development and Application of Electric Refrigeration." Mr. R. C. Washington.

JUNIOR INSTITUTION OF ENGINEERS.—Friday, April 24th Hotel Metropole, London. Annual dinner. Wednesday, April 29th. Visit to the works of Waygood-Otis, Ltd., London, S.E.

INSTITUTE OF FUEL.—Wednesday, April 29th. Visit to Corporation Electricity Works and the International Combustion Co.'s Works, Derby.

INSTITUTION OF ELECTRICAL ENGINEERS.—Thursday, April 30th. Institution, London. 6 p.m. The 22nd Kelvin lecture. "The Architecture of Solids." Prof. W. L. Bragg. *London Students' Section.*—Friday, April 24th. Institution, London. 6.15 p.m. "The Design and Manufacture of Electrical Apparatus." Mr. J. Dunbar. Saturday, April 25th. 2.30 p.m. Visit to Wild-Barfield Electric Furnaces, Ltd., Holloway. *Meter and Instrument Section.*—Friday, May 1st. Institution, London. 7 p.m. "High-voltage Precision Measurements." Prof. W. M. Thornton. Saturday, May 2nd. Visit to Cambridge, including the works of the Cambridge Instrument Co., Ltd.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (*Western Sub-Branch*).—Saturday, May 2nd. Swansea. Annual dinner.

Our Service Department

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following :—

"SWEEPER-VAC" electric vacuum cleaner.
"A.E.M." Type D.X. Serial No. 7927, 500/550 volts. Main motor switch.
Brass double ended holders and adaptors to accommodate a large bayonet cap type bulb.

Notes

South African Municipal Engineers

On page 731 of this issue we reproduce a group photograph taken on the occasion of the tenth convention of the Association of Municipal Electrical Engineers of the Union of South Africa and Rhodesia held at Pretoria from March 23rd to 28th. A large number of members and delegates from various parts of the country attended, and at the opening meeting the following officers were elected :—President, Mr. L. L. Horrell (Pretoria); vice-president, Mr. L. F. Bickell (Port Elizabeth); past-presidents, Messrs. R. Macaulay (Bloemfontein) and J. Roberts (Durban); members of council, Messrs. A. T. Rodwell (Johannesburg), F. C. D. Mann (Worcester), G. H. Swingler (Capetown), and T. Millar (Harrismith); hon. secretary and treasurer, Mr. E. Poole (Durban). The following papers were read during the week and evoked useful discussion : "Development of a Domestic Load in a Small Inland Town," by Mr. J. Vowles (Kingwilliamstown); "The Advantages of Electrical Bulk Supplies compared with Municipal," by Mr. L. Ralston (Dundee); "Alternating-current Distribution in Residential Areas," by Mr. D. J. Hugo (Pretoria); "Preservation of Poles for Electric Supply and Telephone Lines," by Mr. N. B. Eckbo (Government Timber Investigation Officer); and "Difficulties of Developing a Municipal Electrical Scheme with Gas Engines as Prime Movers," by Mr. A. R. Metelerkamp (Salisbury). A report was also presented by Mr. J. B. Bullock, chairman of the organising committee of the Electrical Development Association of South Africa, followed by an address by Mr. A. M. Jacobs, of the Electricity Supply Commission, and delegates were elected to form the working committee of the Association. It is hoped to follow the lines of the Home association in their aims and objects. One day of the week was spent in Johannesburg when a lecture and demonstration was given by Mr. E. S. Evans, of the South African Lighting Service Bureau, which also entertained the convention party to lunch, and in the evening the members were guests to dinner of the South African Institute of Electrical Engineers. Later they attended a meeting of the Institute at which Mr. A. T. Rodwell read a paper on "Road Passenger Transport Systems with special reference to Electric Trolley Omnibuses and Overhead Equipment." Among other matters dealt with during the week was the matter of the licensing of electricians and the registration of wiring contractors, for which early legislation is proposed. It was decided that the next convention should be held in Port Elizabeth in September, 1932.

The C.E.B. on the N.E. Coast

Our local correspondent on the North-East Coast advises us that the C.E.B. is making excellent progress with the grid scheme in the North-East. He says: "At the area offices I was informed that they are well up to schedule with the scheme—in some cases ahead—and it is anticipated that the whole of the overhead transmission system will be completed by September next. The scheme as a whole, of course, cannot be put into full operation for some time after that, but officials are eminently satisfied with progress achieved to date.

The question of wayleaves has caused considerable initial trouble, but on the whole it has been very successfully surmounted. For the 182 miles to be covered, in which there will be erected 1,340 towers, 979 consents were necessary. To date 711 consents have been received, covering 148 miles and 792 towers. Sixty-two local authorities had to be consulted, and 54 have given consent.

The route of the principal main transmission lines along the coast route as originally planned, would, owing to the salt-laden atmosphere, involve risk of interference with the supply and the Board accordingly decided to modify the original scheme as stated in its third annual report (Electrical Review, March 27th, 1931.)

The works specified in the scheme comprise about 90 miles of principal main transmission lines to be designed to operate at 132,000 volts, about 90 miles of lower voltage transmission lines and 13 transforming stations.

The full measure of progress achieved in a period of little over a year can only be realised after a visit to the headquarters at Grid House, where, by the courtesy of Mr. G. Maxwell Buist, the district engineer of the C.E.B., I was conducted through all departments. In the first place it should be stated that in the comparatively short period of little over a year, the selection and survey of routes of the transmission lines have been completed, and the sites for nearly all the transforming stations have been obtained, with the result that work in the field is now in full swing.

It was explained that after the lines had been provisionally surveyed, the owner and occupier of every acre of land over which the line was to pass had to be officially notified and supplied with large scale plans showing the route of the line and the exact places where towers would be erected. There being 180 miles of lines, and plans having to be kept for office reference purposes, this entailed the making of several thousands of plans in triplicate. On the other side the general office staff had the huge task of sending out all the notices, filing consents, and dealing with objections. The result is to be found in a perfected filing system by which any one of thousands of fields can be looked up at a moment's notice, the names of the owners and occupiers revealed, and the exact position of the towers indicated.

A more spectacular result is to be found in the large coloured plans which cover the walls at Grid House, which not only indicate all the above details, but the exact state of progress which has been achieved to date. Not bad work in the time for a staff small enough to be housed comfortably in a suburban villa!

The work too, in the North-East, has been complicated by the necessity for the change in frequency which was originally scheduled to take ten years, but which, since the adoption of the scheme, has been accelerated to about half that time."

Airmen and Lightning

The Air Ministry, in a warning to airmen of the danger arising from trailing aerials during storms, quotes a recent case in which the wireless instruments were seriously damaged when an aeroplane was apparently struck by lightning. The notice suggests that to safeguard aircraft against atmospheric discharges the trailing aerial should be short-circuited to "earth" and reeled up, or, alternatively, cut away in emergency. The telephones should be disconnected and the wireless set should be switched off.

New Safety First Idea

At a meeting of the Merseyside Industrial Safety First Committee attention was drawn to a new electrical invention which had been found very serviceable in the printing department of Lever Bros. in order to prevent the risk of injury to operatives by machines being started whilst cleaning work was in progress. The mechanism is a locking device for Berry switches and Brookhirst d.c. motor starters. It consists of a simple lock, double bolt and disk attached to the starter. A notch is cut out on the switch spindle. When the spindle is withdrawn, a sliding pin is engaged with the notch, and at the same time a red disk is projected, indicating that the switch is locked in the "off" position.

The Electrical Association for Women

At a meeting of the North Wales branch of the Association there was some discussion on a proposal to create groups or sub-branches throughout North Wales and thus decentralise the work of the organisation. The area at present covered by the North Wales branch extends nearly from Wrexham to Caernarvon, and it is thought desirable that sub-branches should be formed in the principal towns in North Wales, so that members might arrange for their own activities and thus avoid the time and expense involved in travelling to a more or less fixed meeting place.

French Electric Warships

Turbo-electric plant may drive the new French battle cruisers, the first of which, provisionally named *Dunquerque*, is to be laid down this autumn. The French naval authorities are to build their battle cruisers more than twice as large as the German *Ersatz Preussen* and her sisters, besides being much faster and more heavily armed, says the *Daily Telegraph*. The plans prepared by the Section Technique of the Ministry of Marine are understood to have been finally passed, and the turbo-electric drive is favoured because it allows of a more extensive sub-division of the hull into water-tight compartments, thus giving the ship better protection against torpedoes and mines. The ships will have a maximum speed of 31½ knots, and carry enough fuel-oil for a voyage of 12,000 miles at a lower speed. Besides the main armament there will be a powerful battery of anti-aircraft guns of the new "electric" model, which is said to be capable of a fast rate of fire. As in the case of the German ships, electric welding will largely replace rivetting in the construction of the *Dunquerque*, and other weight-saving methods will be employed.

The British Association

The British Association for the Advancement of Science has issued the preliminary programme for its centenary meeting which is to be held in London from September 23rd to 30th, *i.e.*, at the time of the Faraday Centenary Celebrations. The president for 1930-31 is Lt.-Gen. the Right Hon. J. C. Smuts, P.C., C.H., F.R.S. Sir J. J. Thomson, O.M., F.R.S., is president of the Mathematical and Physical Sciences Section, and Sir J. A. Ewing, K.C.B., F.R.S., is president of the Engineering Section. The Evening Discourses will include a lecture by Sir Oliver Lodge—"A Retrospect of Wireless Communication." Enclosed with the preliminary programme are the necessary registration forms for the meeting, and an appeal for subscriptions to the Association's £40,000 Centenary Fund, from which it is proposed to meet the expenditure appropriate to the fitting celebration of the Centenary and to maintain and extend the Association's activities for the advancement of science in a number of directions.

Appointments Vacant

Electrical engineer and manager for Hove Electricity Department.

Probationary assistant engineers in the Engineering Department of the Post Office.

Assistant engineer in distribution section of Hastings Electricity Department.

(See our advertisement pages to-day.)

A Welded Sea-going Vessel

One of the first sea-going vessels to be welded throughout was the *m.v. Fullagar* which has now been in service for 11 years, and her behaviour during that period is of particular interest. On completion the vessel went into the service of her owners, Messrs. T. & J. Brocklebank, and later was acquired by the Manx Isles Steamship Co., Ltd., and renamed "*Caria*." During the vessel's career with these companies she passed through very strenuous service in the coastal trade. The vessel has been aground through stress of circumstances several times, and on each examination later in dry dock the keel and bottom plating were found to have withstood the excessive strain of grounding without any ill effects to the welded joints.

In 1924 the vessel went aground on a sandbank in the Mersey, and when docked the bottom was found to be set up 11 in. from bilge to bilge over a length of roughly 70 ft. The opinion was expressed that not only had the welding stood a remarkable test, but had she been a riveted ship she would have been a total loss.

Damage to m.v. "Shean"

Permission was given for the vessel to voyage across the Atlantic and through the Panama Canal to the North Pacific Coast, where she has since been employed by her new owner, the British Columbia Cement Company, British Columbia, which has renamed the vessel *Shean*. In October last the *Shean* struck a rock cliff in the Saanich Inlet near Victoria when going at full speed with 10,000 bags of cement on board. The accompanying illustration shows the extent of the damage, and on examination it was found that in no case did the plates tear apart at the welds, but above and below in the solid plate. Lloyd's and the underwriter's surveyors have stated that the relatively slight amount of damage was a remarkable tribute to the welded vessel. Had the vessel been riveted, the damage would have no doubt extended beyond the fore peak bulkhead and caused flooding of the cargo space. The *Shean* has since been repaired in strict accordance with her class, has passed her tenth annual survey satisfactorily, and is in good condition. The ship was welded with the Quasi-Arc Co.'s methods and electrodes.

Ultra-violet Food Treatment

Laboratories are being established in America jointly by the General Foods Corporation and the University of Cincinnati for the application to food of a new process to be known as "selective irradiation," devised by Prof. George Sperti, of the University, as the result of breaking down ultra-violet rays and determining their specific characteristics. He discovered that there is a critical wave-length at which biological and other reactions begin which affect changes in the taste, smell, consistency, &c., of food, but that wave-lengths considerably shorter result in the destruction of bacteria, formation of vitamin D, for instance, starting at a wave-length of about 3,100 Angstrom units. Striking applications of this discovery have followed: for example, milk can be irradiated under the new process without affecting its smell, taste, or colour, while its vitamin D content is increased. Orange juice can be treated after extraction so that it retains its original flavour for indefinite periods. Fermentation, yeast moulds, and various forms of food spoilage are checked. Refrigeration is not required as an auxiliary aid to these results.

Engineering Education

The report on "Education for the Engineering Industry" (H.M. Stationery Office, price 1s. 3d. net) of the committee appointed by the President of the Board of Education (the Right Hon. Lord Eustace Percy, M.P.) in 1928 "to advise the Board of Education as to the scope and methods of the Board's inquiry into technical education for the engineering industry, and to review the material furnished to the Board in the course of the investigation," has been issued this week. Attention is drawn to the following matters as being of outstanding importance: the possible development of junior technical schools: extended recruitment from secondary schools, the need for closer contact with these schools, and for the careful consideration by the industry of the age of recruitment for apprenticeship from schools other than elementary: recruitment of university graduates and their increased employment in productive engineering and management; the possibility of establishing a systematic recruiting policy for the industry related to educational factors, including the raising of the school-leaving age; attendance of apprentices and others at part-time day classes; subjects of instruction in technical colleges in relation to national certificate schemes; development of courses for boiler makers, foundrymen and other types of craftsman; and the steps to be taken to secure closer contact between the industry and technical colleges, and particularly the co-operation of foremen in engineering education.

Depreciation

Three Special Orders have been made by the Electricity Commissioners under the Electricity (Supply) Acts, 1882 to 1928, and confirmed by the Minister of Transport under the Electricity (Supply) Act, 1919. These are known as:—

(1) Scale of Depreciation (Acquisition of Selected Generating Stations and Main Transmission Lines) Special Order, 1931.
(2) Scale of Depreciation (Cost of Production at certain Selected Generating Stations) Special Order, 1931.
(3) Scale of Depreciation (Transmission Line Allowance) Special Order, 1931.

These are published by H.M. Stationery Office at 6d. each. Schedules to the Orders give the following particulars:—

Asset.	Years. (1)	(2)	(3)
Buildings and other civil engineering works of a permanent character (other than hydro-electric works)	30	30	—
Generating and other plant and machinery ...	20	20	—
Underground cables	40	—	40
Overhead lines	25	—	25
Step-up and step-down transformers and switchgear necessary to and used for the control of such cables or overhead lines ...	20	—	20
Buildings or such parts thereof as may be required to accommodate such transformers or switchgear	30	—	30
Leasehold interest in the land ...	Period of lease or period remaining unexpired on the assignment of the lease.		
Clearing the site	Period of lease remaining unexpired at the date of clearing the site.		

Rural Electrification in Illinois, U.S.A.

Progress in rural electrification made by the Public Service Company of Northern Illinois during 1930 indicates that much can be done even in a bad business year in extending lines to and in promoting the use of energy by farm consumers.

Total miles of farm line in service	2,251
Miles of farm line built during 1930	466
Number of farms connected during 1929	1,299
Number of farms connected during 1930	2,017
Percentage of farms served to total number in territory, per cent.	28.8
Yearly gross revenue estimated for new business signed during 1930	£28,400

A contributor to the *Electrical World* states that this result was made possible by intelligent and extensive co-operation with the farmer through a rural service department whose personnel is adequate in training and in numbers. The staff was trained through the medium of rural electrification short courses.

It has been found that demonstrations of equipment on the farmers' premises which allowed the farmers to judge for themselves, was one of the greatest aids in selling equipment. Such demonstrations in 1930 were confined entirely to feed grinding, silo fil'ing, electric cooking and water pumping. Credit is due to the manufacturers of these equipments for their hearty co-operation in furnishing machinery economical to operate.

Transportable Winder for Collieries

In view of the importance of reducing the time necessary for the replacement of the cables of colliery winding engines, the Société des Ateliers de Constructions Electriques of Charleroi, which has in recent years equipped a large number of Belgian collieries with electric winding engines, recommend in the case of large undertakings with several pits the provision of reserve transportable plant, the winding gear of which is mounted on a turntable on an ordinary platform railway truck, so that it can be fixed in any suitable position near the pit mouth. At each corner of the two ends of the wagon special jacks and gripping devices are fitted to hold the wagon securely in position. While it is realised that such a reserve installation may not be an economic proposition for a small colliery, it is suggested that where there are a number of small independent undertakings in a mining area the different proprietors might join together in acquiring and maintaining a transportable winding engine, mutual arrangements being made as to periods and payments for the use of the plant.

I.E.E. "Summer" Meeting

As we go to press we have received from the Institution of Electrical Engineers a copy of the draft programme for the "summer" meeting in London. This is to be held in conjunction with the Faraday Centenary Celebrations and opens on September 22nd, continuing until the evening of September 25th. The programme includes lectures, visits to the Faraday Exhibition and places of technical interest, and social functions.

The Buenos Aires Port Works

A message to *Reuter's Trade Service* from Buenos Aires says that the progress made on the final stage of the new port works at Buenos Aires leaves no doubt that, once trade revives, the port will be able, for the first time, to serve the needs of the largest commercial entrance to the Argentine Republic.

Accommodation will be practically doubled, and ships of the largest tonnage, entering directly from a channel communicating with the north-canal, will be able to come alongside. A feature of the new port will be its complete and up-to-date mechanical equipment, including powerful electric travelling cranes. All the buildings, which have unusually large basements, are interconnected by underground passages through which goods are carried on rails in electrically-propelled trucks.

A Siemens-Marx Impulse Generator for Holland

The Siemens & Halske Co. of Berlin has recently completed for the laboratory of the Association of Managers of Electricity Works of the Netherlands equipment for generating high continuous and impulsive voltages, using the multiplying circuits of Dr. E. Marx. The equipment itself consists of eight condensers, connected in the well-known manner and arranged in stages. Each condenser has a capacity of 0.07 μF and is designed for a working voltage of 70 kV. The construction is such that at any future date a second condenser of equal capacity can be connected in parallel if desired without alteration of the equipment. The total capacity was fixed by the requirement that the stored energy at 500 kV should be at least 2,000 W-seconds. The condensers are charged in parallel through high resistances and discharged in series through trigger gaps. The control mechanism of the gaps is interconnected by means of insulating rods. A motor on the bedplate of the impulse generator permits remote control of the gap settings. The spark gap on the uppermost stage (the isolating gap) passes the impulse to the article under test and is also connected with an insulating rod to the trigger gaps and operated by the same motor. Charging the generator is effected by rectified alternating voltage with the aid of hot-cathode rectifiers, which, together with their filament transformers, form a movable unit. The filament transformers are oil immersed, the secondary/primary insulation being designed for 90 kV. "Hedgehog" transformers, often used for rectifier installations, were unsuitable in the present case as the equipment is intended also for the generation of a continuous voltage in conjunction with a cathode-ray oscillograph. The impulse generator is intended for investigating high-voltage phenomena and will later be used in connection with a Tesla transformer for the generation of damped high-frequency oscillations.

German Standards

The Verein Deutcher Elektrotechniker, of Berlin, has found it necessary to issue a new edition of its *Vorschriftenbuch* [18th edition; Berlin: V.D.E. Verlagsabteilung, 18 Rm. (18s.)] in which the standards in use in Germatny in connection with electrical machinery and apparatus and also the principal regulations governing the use of electricity are collated in a convenient form. The new edition is not quite so bulky as the last one, owing to the omission of details of certain standards in relation to productions for which there is not a big demand, and also of certain others which are no longer operative. On the other hand a good deal of new material has been added, including the German standards in respect of operating voltages in h.p. installations; in fact, the book has been brought up-to-date by the inclusion of all the principal regulations and standards in electrical engineering practice issued up to the commencement of the present year.

Testing Electricity Meters

At a recent meeting of Glasgow Corporation the question of the inspection and testing of electricity supply meters was raised. In view of the fact that under Section 6 of the Weights and Measures Act, 1889, the Board of Trade is authorised to make standards for that purpose, but that no standards have yet been provided, it was agreed at the last meeting of the sub-committee on special Acts that it be remitted to a special sub-committee to confer with the Electricity Committee on the subject, to arrange for a conference of representatives of each of the larger burghs in Scotland, and to take such steps as the conference may consider necessary to bring the subject before the Board of Trade with a view of getting the Board to take action in connection with the matter.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Our Buenos Aires correspondent says that **Mr. Victor Watlington,** chairman of the Council of the British Electrical and Allied Manufacturers' Association, together with **Mr. H. C. Siddeley,** special representative of the B.E.A.M.A., were entertained at an informal dinner at the English Club, Buenos Aires, by past and present members of the committee of the Argentine Local Centre of the I.E.E. on March 26th. In the unavoidable absence of Mr. Ratcliffe Wright, the president of the Centre, Mr. Frank Harris, vice-president, and manager in Buenos Aires for W. T. Henley's Telegraph Works, Ltd., took the chair. Among those present were Mr. Mervyn F. Ryan, general manager of the Buenos Aires and Pacific Railway Co., Mr. A. C. Kelly, chief electrical engineer of the latter company and hon. secretary of the Local Centre of the I.E.E., Mr. L. W. Migotti and Mr. H. B. Sale, past-presidents of the Centre, Mr. R. G. Parrott, local representative of the Metropolitan-Vickers Electrical Export Co., Ltd., Mr. A. Tabossi, local representative of the British Thomson-Houston Co., Ltd., and Mr. G. W. Munday, consulting electrical engineer to the British Empire Trade Exhibition. On March 28th, on Mr. Watlington's invitation, members of the I.E.E. joined him and Mr. Siddeley at lunch at the Exhibition restaurant. After lunch, members proceeded to the B.E.A.M.A. stand in Pavilion No. 6, and then inspected the engineering exhibits.

In our last issue we described the electric kitchen equipment at the Overseas League Club, Edinburgh. Our readers may be interested to learn that **Miss Mary Parker,** daughter of Mr. J. H. Parker, the electrical engineer to the L.C.C. Tramways, is assistant supervisor at the Club. Miss Parker was appointed to this position after gaining the *cordon bleu* in cookery at the Edinburgh College of Domestic Science; she has a thorough knowledge of electrical equipment, which is no doubt hereditary.

Mr. H. B. Whitmore was the guest of honour at an informal dinner, held at the Grand Hotel, Manchester, on April 17th, to mark his retirement (after 22 years service) from the position of chief draughtsman to the Lancashire Dynamo and Motor Co., Ltd., and to wish him every success in his new work as a consulting engineer. During the evening Mr. Whitmore was presented with a carved oak bureau, surmounted by a glazed-front bookcase, together with a revolving chair to match, on behalf of the company's staff. He also received a case of pipes from several former colleagues.

Mr. E. A. Mills, deputy engineer and manager of the Leicester Electricity Department, has been appointed borough electrical engineer of Halifax, at a salary of £1,000 per annum, in succession to Mr. Rendell-Baker, who recently became borough electrical engineer of Croydon. There were 85 applicants for the position.

Mr. D. M. Thornton, B.Sc., who is leaving the service of the Lothians Electric Power Co. to take up the position of district engineer with the Dumfries County Council, was presented by his colleagues with a gold wristlet watch last week.

Mr. Samuel Insull, the prominent leader of the American electric power industry, paid a visit last week to the Ardnacrusha station of the Shannon power scheme and was conducted over the undertaking by Dr. T. McLoughlin, managing director of the Electricity Supply Board, and Mr. Strand, chief operating engineer at Ardnacrusha.

Mr. Duncan P. Morrison, engineer and general manager of the Dundee Corporation Transport Department, has been appointed to the position of general manager of the Hull Corporation tramway and omnibus undertakings, at a commencing salary of £1,000 per annum.

Sir Holberry Mensforth, chairman of the English Electric Co., Ltd., is leaving for New York to-day (Friday). It is reported that he intends to examine the American and Canadian electrical development which has taken place during the past few years.

Mr. W. R. Gibbings, station superintendent in the Dewsbury Corporation electricity works, has been appointed commercial engineer, at a salary of £300 per annum, plus payment of compensation based on the difference between his present salary, £396 per annum, and the salary stated. The change has been caused by the closing down of the generating station in favour of a bulk supply.

At a recent meeting of the Portsmouth Corporation, the chairman of the Electricity Committee was asked what increases the borough electrical engineer (**Mr. B. Handley**) had received since his salary had been paid on output. The reply was that in 1926-27 the salary was £1,080, representing an increase of £30. Subsequent increases were as follows: 1927-28, £205; 1928-29, £60; 1929-30, £70; and 1930-31, £55 increase.

Mr. A. J. Clarke, district manager of the Merthyr Electric Light Co., of Aberfan, was married to Miss C. E. Harris, of Chard, on April 7th.

At the Church of Kinlochleven there was recently unveiled a memorial window to **Mr. Andrew Wilson Tait,** who was for many years chairman of the British Aluminium Co., Ltd.; was

a director of various electrical companies; and was a member of Council of the B.E.A.M.A. The window was presented by Mrs. Tait and her children.

Mr. T. D. Martin, of South Shields, has been appointed borough electrical engineer of Nelson at a commencing salary of £700 a year, rising by two annual increments of £50 to £800 with an allowance of £100 per year for a motor car. His duties are to include, for a temporary period, supervision of the light railways and omnibuses. Mr. Martin was chosen from 123 applicants. He is 47 years of age and has been deputy engineer at South Shields since 1922. He is a member of the Institution of Electrical Engineers, and has been connected with public supply undertakings for 20 years. Prior to going to South Shields he was control engineer at the Carville station of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and, for a time, a consulting engineer. He was president of the E.P.E.A. in 1929-30.

Alderman T. E. Higham, J.P. (Accrington), was re-appointed chairman, and **Alderman H. R. Nuttall,** J.P. (Burnley) vice-chairman at the recent annual meeting of the Mid-Lancashire Electricity Advisory Board.

Mr. G. Hally has been appointed traffic manager of the Metropolitan Railway. He is to continue his duties as mechanical engineer.

The presentation of the tenth Faraday Medal to **Mr. C. H. Merz** is to take place at the ordinary meeting of the Institution of Electrical Engineers on April 30th, immediately prior to the delivery of the twenty-second Kelvin Lecture by **Prof. W. L. Bragg,** F.R.S.

Mr. L. J. Kettle, the late director of the Dublin electricity undertaking, was presented last week with a cheque and an illuminated album from a large number of subscribers. The Lord Mayor of Dublin presided over a large gathering at the Mansion House and made the presentation. A tribute was paid to Mr. Kettle for his 25 years' work in Dublin by Mr. P. McGilligan, the Irish Free State Minister of Industry and Commerce. In his acknowledgment Mr. Kettle said that the gift would enable him to realise a life-long ambition—to found a premium in the Institution of Civil Engineers.

Mr. E. A. Anderson, electrical engineer to the Walton-on-Thames Urban District Council, has had his salary raised from £600 to £650 per annum.

Mr. A. L. Fielding, A.M.I.E.E., was married, on April 8th, to Miss Zena Saxon, of Rugby.

Mr. Kenneth Smith, electrical engineer, Milnsbridge, Huddersfield, was married to Miss Marjorie Dyson, Linthwaite, on April 14th.

Mr. James Dalrymple, formerly general manager of the Glasgow Corporation Tramways, who is at present on a world tour, was recently entertained by the Melbourne Tramways Board.

Mr. T. G. Otley, assistant general manager and consulting engineer of the Victoria Falls and Transvaal Power Co., Ltd., has arrived in England.

Mr. Forbes Mackay, general manager of the Sydney Electricity Department, has survived another attempt to reduce his salary of £3,000 a year. It appears that there is a movement for the revival of the subject every six months. Seven Labour aldermen vote for the reduction and seven Reform aldermen as consistently vote against it, the Lord Mayor deciding with his casting vote.

Obituary

Mr. J. Teasdel.—We regret to report the death, on April 11th, of Mr. John Edwin Teasdel M.I.E.E., who had been electrical engineer and tramway manager to the Pontypridd Urban District Council since 1904. Mr. Teasdel was a native of Yarmouth and after his apprenticeship entered the service of the Cardiff City Council, eventually becoming deputy electrical engineer. He was 62 years of age and leaves a widow and four children.

Mr. Cecil A. Grut, manager and engineer of the Inverness Corporation electricity undertaking, died at sea on April 16th. He was on a voyage to the Canary Islands when he had a cerebral seizure. Mr. Grut, who was formerly in the employment of Edmundson's Electricity Corporation, was appointed to take charge of the Inverness undertaking five years ago, and had carried out important extensions, including a hydro-electric scheme. He was a native of the Channel Islands and was 43 years of age.

Wills.—The late **Mr. Charles Tothill,** a former superintendent of the Eastern Telegraph Co., left estate valued at £4,783 (£2,974 net personalty).

The late **Mr. Cecil L. Reed,** a director of the Venezuela Telephone and Electrical Appliances Co. Ltd., and other concerns, left estate valued at £5,307 gross (£5,021 net).

Mr. Frank Bedwell, a former director of the Scarborough Central Tramway Co., left £13,503 (£13,170 net personalty).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered

Radio Developments, Ltd.—Private company. Registered April 11th. Capital, £100 in £1 shares. Objects: To establish and maintain wireless signal stations; to manufacture and deal in wireless, electrical, and telephone appliances, &c. The permanent directors are: D. F. Gamble-Jones, 24, Portland Place, Brighton; R. C. Moore, 35, Edburton Avenue, Brighton; E. E. Petherick, 33, Baden Road, Brighton; N. R. Phelp, 8, Middleton Avenue, Hove; and S. F. Youles, Waterloo House, Waterloo Street, Hove, all wireless engineers. Solicitors: Colbourne, Bush & Bartlett, 62, Old Steine, Brighton.

Warnes & Dust, Ltd.—Private company. Registered April 10th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, and dealers in, electrical, wireless, and photographic apparatus, cinema projecting apparatus, &c. The first directors are: C. E. Dust, Dunbar Works, Dunbar Street, West Norwood, radio engineer; I. A. V. Pardy, 154, Effra Road, Wimbledon, S.W., civil servant; W. W. Warnes, 77, Wardour Street, W.1, radio engineer. Registered office: 24, D'Arblay Street, W.1.

Downward & Mackereth, Ltd.—Private company. Registered April 13th. Capital, £2,000 in £1 shares. Objects: To acquire the business of wireless engineers carried on by F. B. H. Higgin and G. H. Mackereth, at 9, Cavendish Street, Ulverston, Lancs., as "Downward and Mackereth." The directors are: G. H. Mackereth, Rock House, Victoria Road, Ulverston, Lancs.; W. Tindall, 13, Garden Lea, Ulverston, Lancs. (both permanent).

World's Radio (Scotland), Ltd.—Private company. Registered April 9th in Edinburgh. Capital, £250 in £1 shares. Objects: To carry on the business of manufacturers, merchants, exporters, importers, agents and distributors, wholesale and retail dealers in radio apparatus, accessories, &c. The directors are: R. Summers, 599, High Road, Leyton, E.10 (director World's Supplies Manufacturers, Ltd.); F. W. Edwards, 599, High Road, Leyton, London, E.10, company secretary and director; W. H. Grahamslaw, 8, East Mayfield, Newington, Edinburgh, consulting engineer. Secretary: F. W. Edwards. Registered office: Room 8, Synod Hall, Castle Terrace, Edinburgh.

Anderson, Clark & Moir, Ltd.—Private company. Registered April 17th. Capital, £7,000 in £1 shares. Objects: To acquire the business of wholesale factors and importers of wireless apparatus and materials carried on by Clark & Moir, Ltd., at 34, Marsh Street, Bristol. The permanent directors are: I. F. Anderson, "Woodrange," Henbury Road, Westbury-on-Trym (chairman and managing director); A. W. Moir, "Avalon," Old Sneyd Road, Stoke Bishop, Bristol; J. S. Clark, address not stated.

S. Dickinson, Ltd.—Private company. Registered April 10th. Capital, £1,000 in £1 shares. Objects: To acquire the business of an electrical engineer carried on by S. Dickinson, at 104, Oldham Road, Manchester. The subscribers (each with one share) are: S. Dickinson, 11, High Lane, Chorlton-cum-Hardy, Manchester, electrical contractor; G. A. Holdsworth, 75, Cringle Road, Levenshulme, Manchester, clerk. S. Dickinson is the first director.

Express Engineering Co., Ltd.—Private company. Registered April 17th. Capital, £1,000 in £1 shares. Objects: To carry on the business of radio equipment manufacturers and dealers, electrical and mechanical engineers, &c. The first director is L. H. Wyatt, 34, St. Margarets Road, Longfleet, Dorset, radio engineer. Registered office: Room 14, 147, Corporation Street, Birmingham.

Wayland Smith (Eastbourne), Ltd.—Private company. Registered April 17th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, and dealers in, electrical accumulators, batteries, dynamos, motors, magnetos, and electrical plant, &c. The directors are: V. M. Wood and Mrs. Lilian Wood, 9, Victoria Place, Eastbourne. Solicitors: Hibbert & Pownall, 127, Old Street, Ashton-under-Lyne.

J. H. Plant, Ltd.—Private company. Registered April 15th. Capital, £1,000. Objects: To acquire the business of an electrical engineer and dealer in electrical equipment, &c., carried on by J. H. Plant, at Plaistow Lane, Bromley, Kent. The directors are: J. H. Plant and Ivy E. Plant. Registered office: 11, Plaistow Lane, Bromley, Kent.

Official Returns of Electrical Companies

Langham Radio, Ltd.—C. C. Lyon, 69, Leadenhall Street, E.C.3, ceased to act as receiver or manager on April 2nd, 1931.

Electric Construction Co., Ltd.—Satisfaction to the further extent of £2,900 on March 31st, 1931, of trust deed dated December 16th, 1897, and registered September 10th, 1908, securing £200,000 perpetual first mortgage debenture stock.

Troup, Curtis & Co., Ltd.—Satisfaction to the extent of £500 on September 30th, 1929, and to the extent of £2,500 on February 27th, 1931, of debentures authorised July 5th, 1916, and registered July 25th, 1916, securing £3,000. (Notice filed April 8th, 1931.)

Autocar Electrical Co., Ltd.—Charge on 16, Worcester Street, Gloucester, dated April 8th, 1931, to secure £1,500. Holder: F. J. Pope, Gloucester.

Weston Electric Lamp Co., Ltd.—Charge on the company's property, present and future, including uncalled capital, dated March 25th, 1931, to secure all moneys due to the chargees (Selco, Ltd., 1-3, Brixton Road, S.W.), under the provisions of the deed and not exceeding at any one time £1,000.

Gem Labor Saving Device Co., Ltd.—Second mortgage debenture dated April 10th, 1931, to secure £15,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. Taylor, Red House, Cheam, Surrey.

J. A. Jones, Ltd.—Debenture dated April 2nd, 1931, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: D. A. Jones, Kingsgarth, Farm Avenue, Cricklewood, N.W.

Eastern Wireless Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1930 (filed January 13th, 1931). All shares taken up. £500 paid. Mortgages and charges, nil.

Stanfield Radio Co., Ltd.—Capital, £10,000 in £1 shares. Return dated January 13th, 1931. 7,002 shares taken up. £2,002 paid. £5,000 considered as paid. Mortgages and charges, nil.

Quadruple Valve Co., Ltd.—Capital, £2,000 in £1 shares. Return dated September 19th, 1930 (filed March 10th, 1931). All shares taken up. £500 paid. £1,500 considered as paid. Mortgages and charges, nil.

P.S.R. Lamp Co., Ltd.—Capital, £20,000 in £1 shares. Return dated January 13th, 1931. 14,750 shares taken up. £2,750 paid. £12,000 considered as paid. Mortgages and charges, nil.

Ferranti, Ltd.—Capital, £900,000 in 500,000 7 per cent. cumulative preference shares of £1 and 800,000 ordinary shares of 10s. each. Return dated November 4th, 1930. 396,166 preference and 600,000 ordinary shares taken up. £250,000 paid on 250,000 preference shares. £446,166 considered as paid on the remainder. Mortgages and charges, nil.

Wilson, O'Brien & Murphy, Ltd.—Capital, £7,000 in £1 shares. Return dated December 31st, 1930 (filed March 19th, 1931). 5,001 shares taken up. £901 paid. £4,100 considered as paid. Mortgages and charges, nil.

General Accessories Co., Ltd.—Capital, £3,000 in 1,580 6 per cent. preference, 920 5 per cent. preference, and 500 ordinary shares of £1 each. Return dated January 14th, 1931. All shares taken up. £1,580 paid on the 6 per cent. preference shares. £1,420 considered as paid on the 5 per cent. preference and 500 ordinary shares. Mortgages and charges, £3,000.

Electric and Radio Supplies, Ltd.—Capital, £100 in £1 shares. Return dated July 29th, 1930 (filed February 25th, 1931). 16 shares taken up. £16 paid. Mortgages and charges: nil. A return of allotments, made up to February 11th, 1931, showed a further 5 ordinary shares allotted, payable in cash. The shares were allotted for a consideration of £500 in cash (£1 per share and £99 premium each).

Great Asby Electric Light and Water Co., Ltd.—Capital, £2,000 in £5 shares. Return dated December 27th, 1930. 282 shares taken up. £1,410 paid. Mortgages and charges, nil.

Auto Electric Devices, Ltd.—Capital, £50,000 in 1s. shares. Return dated January 6th, 1931. 700,000 shares taken up. £29,000 paid. £6,000 considered as paid. Mortgages and charges, nil.

Henshall Bros., Ltd.—Capital, £1,500 in £1 shares. Return dated July 19th, 1930 (filed February 21st, 1931). 1,000 shares taken up. £100 paid. £900 considered as paid. Mortgages and charges, nil.

Etherwave, Ltd. (formerly Symper & Evershed, Ltd.).—Capital, £1,000 in £1 shares. Return dated November 18th, 1930 (filed March 12th, 1931). All shares taken up. £1,000 paid. Mortgages and charges, £500.

Rangoon Electric Tramway and Supply Co., Ltd.—Satisfaction to the extent of £34,781 on December 31st, 1930, of £250,000 first mortgage debenture stock authorised by resolutions and secured by trust deeds dated February 1st, 1906, December 22nd, 1908, November 5th, 1913, and January 25th, 1924, and registered February 15th, 1906, December 31st, 1908, November 18th, 1913, and March 10th, 1924, respectively.

City Notes

English Electric Co., Ltd.

The annual meeting was held on April 16th, Sir Holberry Mensforth (chairman) presiding. Referring to the accounts, which were summarised in our last issue (p. 681), the chairman said that the preference shares had increased from £983,565 to £1,135,844, making a net increase of £152,279, which was brought about by the reduction of £491,784 under the reorganisation scheme, and by the addition of £644,060 of new preference shares issued in part conversion of the 6 per cent. second debenture stock. The ordinary share capital was some £220,000 lower than last year's figure, which was accounted for by the writing down of the old ordinary shares by £1,386,690 on the one hand, and on the other by the issue of £1,166,130 new ordinary shares. As regards the debenture debt, the total showed a large reduction compared with the previous year's figures, *viz.*, from £2,081,748 to £1,196,093. Sundry creditors and estimated liabilities had been reduced from £1,451,840 to £563,478, largely owing to the extinction of bank loans. They had written £583,000 off the assets, against which, however, had to be set new capital expenditure during the year amounting to £69,000, leaving a net reduction of £514,000. Stock and work in progress showed a slight increase as compared with last year. The past year had been one of extraordinary difficulty, and these difficulties were reflected in the results of the year's trading. The first half of the year had been occupied in carrying the reorganisation scheme through the meetings and the Court, but as the internal reorganisation was only commenced in the second half of the year, the accounts for 1930 reflected little or none of the benefit of the economies effected during that time. The world trade depression had not made for conditions favourable to the reconstruction and reorganisation of the company. The conditions in the export markets had not been good, and towards the end of 1930 they became distinctly worse; the Indian market, which in the past provided a steady outlet for their products, had been nearly closed due to the troubles there. There had been little demand from the Far East, and Australia had almost ceased to import at all during the last months. Orders had had to be taken at very low prices, and the company had often been faced with the question as to how far it would be justified in accepting orders at cut prices in order to provide for overhead charges at the works. Referring to changes in the directorate, the chairman mentioned the appointment of Mr. G. H. Nelson as managing director, and said that a comprehensive scheme was drawn up at the beginning of October for reorganising the executive and manufacturing facilities of the company with a view to co-ordinating the work of the company's undertaking as a whole and to reduce manufacturing costs without impairing efficiency. These general rearrangements had been accompanied by a reduction of staff, resulting in very substantial economies. A new system of cost accounting had been instituted throughout the undertaking, and it was hoped that this also would lead to considerable economies. The directors were determined that the company should maintain a reputation for first-class service to customers, and to this end three engineers had been specially detailed to undertake the control and co-ordination of engineering, production, and inspection. An agreement had been concluded between the company and the Westinghouse companies of America whereby there would be an exchange of technical information between the two organisations on steam turbines and electrical apparatus. This technical and manufacturing link did not, however, carry with it any control from America. The position in the Home market was not an entirely healthy one, as it had depended to too large an extent on the Government's expenditure for the Grid. This expenditure had been exceptional, and had led to an increase in the productive capacity of the industry, which might prove to be in excess of what the demand in the near future would justify. If the projected plans for the electrification of the main-line railways was proceeded with, it would be of considerable interest to the company, as it was particularly well equipped for heavy traction work of this character. The chairman concluded on an optimistic note and held out cheerful hopes for the future. After some discussion the report and accounts were adopted.

Telephone Manufacturing Co. (1929), Ltd.

The annual meeting was held on April 20th, Mr. F. T. Jackson (chairman) presiding. In presenting the report and accounts (ELEC. REV., April 17th, p. 683), the chairman said that investments in subsidiary companies totalled £11,053, and the investment in Telephone Rentals, Ltd., was £105,428, of which £100,000 was acquired under the scheme of reorganisation in satisfaction of debts due to the old company. During the first seven months of the year under review very little work was going through the factory. In spite of this, the whole of the factory "on-costs" for the year had been absorbed against actual sales, and nothing had been carried in their stock, or in other assets, which could possibly be regarded as of problematical value. Competition for public telephone work was very keen, and unless they were able to secure contracts at remunerative prices they were content for their competitors to take them, although they were able to produce telephone apparatus at as low a cost or even lower than any manufacturer in this country. They were meeting with

a fair amount of success in their investigations of other lines of manufacture, but at the present time these were not sufficient to keep the factory fully employed. They had a constant demand for telephone apparatus from the subsidiary companies controlled by Telephone Rentals, Ltd. In addition to this there was an increasing demand for their laryngaphone apparatus, in which considerable business was being done abroad. The German Dornier D.O.X. flying boat was fitted with this apparatus by C. Lorenz Aktiengesellschaft, who were their agents in Germany. At the present time their factory was fairly well employed, and was likely to be for some months ahead, the actual orders in hand on January 1st being nearly equal to the whole of their output for the year under review. The report and accounts were adopted.

Llanelly & District Electric Supply Co., Ltd.

Presiding at the annual meeting on April 15th, Mr. A. H. Beatty (chairman) in the course of his speech, said that in April last the conditions looked very promising for a substantial increase in the company's profits, and for the first half of the year these prospects were realised. Acute depression in the second half of the year in the coal, steel, and tinplate industries in South Wales, resulted in several collieries and large works in the company's area closing down, which seriously affected the company's receipts for lighting and power. In view of these adverse conditions, they were to be congratulated upon an improved profit, as compared with the preceding year. The Bill promoted by them authorising them to abandon their light railways and to run railless-cars and omnibuses received Royal Assent in July last, and plans for the conversion would shortly be presented to the Minister of Transport and local authorities for approval. During the year under review they took over three non-statutory undertakings operating in the parish of Llandebie and at Tycross, in the parish of Llanedy. New consumers added during the year totalled 847, mostly for domestic and small power loads, and the electrical energy sold totalled 24,516,000 kWh, as compared with 23 675.000 kWh in 1929. It was not expected that the Central Electricity Board's scheme for South-West England and South Wales would be in operation for two or three years, and it was not proposed to extend the grid system beyond Llanelly, so that there was a possibility of some of their surplus power being made available for supplies in West Wales. The report and accounts were adopted.

Drake & Gorham, Ltd.

Particulars were published on Wednesday last (in compliance with Stock Exchange regulations and not as an invitation to subscribe) of an issue of £60 000 5½ per cent. debenture stock, redeemable by means of a sinking fund up to 1953 when the whole of the remaining stock will be paid off. The company has an authorised and issued share capital of £125.000 and the dividend has been at the rate of 5 per cent. for the past five years. The proceeds of the issue are required to repay temporary accommodation obtained to finance the acquisition of land and the building of new works, to extend the company's business, and to provide increased working capital needed in connection with large contracts.

Fife Tramway, Light & Power Co., Ltd.

Mr. G. Balfour presided at the annual meeting at Edinburgh on April 17th in the absence of Mr. Wm. Low (chairman). Mr. Balfour said they had started this year with a balance on the right side instead of a deficit. During the first quarter of the current year, both of the tramway undertakings were on a revenue-earning basis and their returns showed a combined trading profit for the quarter of over £1,600. This improvement was largely the result of the progress which had been made in the consolidation of the position of the undertakings and the efficiencies and economies which had been introduced.

Babcock & Wilcox, Ltd.

The directors' report for the year ended December 31st last shows a net profit of £609,302, as compared with £674,316 in the preceding year. A contribution to the staff fund (£18,597) is deducted, and a balance of £75,991 brought forward is added, making £666,697. It is proposed to pay a final dividend of 7 per cent. on the ordinary shares, making 14 per cent. for the year (against 15 per cent.), and £49,793 is carried forward. The report states that the reduction of the profits is due to the additional amount required for income tax, the fall in value of the exchanges, and the monetary and economic conditions prevailing in many parts of the world.

The " Sofina "

The report of the Société Financière de Transports et d'Enterprises Industrielles (Sofina) shows a balance at profit and loss account of 155,432,054 fr., as against 116,217,000 fr. for the previous period of 14 months. The board proposes to distribute a dividend of 700 fr. gross on the 200,000 ordinary shares. The company has interests in electricity supply and tramway companies in North and South America, Northern Africa, and a number of countries in Europe, and it holds an interest in the Electric & Railway Finance Corporation, Ltd.

Edison Swan Electric Co., Ltd.

The annual meeting was held on March 16th, when Mr. C. F. Spencer (chairman), who presided, in briefly reviewing the accounts for the past year said that the loan of £350,000 from Associated Electrical Industries, Ltd., which appeared in the balance sheet, was required to finance stocks, &c. He referred to the merger during the year of the business of Metro-Vick Supplies with the company and said that the Cable Company was actively occupied. The report and accounts were adopted.

Rees Roturbo Manufacturing Co., Ltd.

The surplus on trading for 1930 was £4,578, from which is deducted debenture and loan interest, leaving a net surplus of £704. The directors consider it advisable to continue the policy of fully depreciating plant and machinery at the usual rate, the amount this year being £2,411, and it is recommended that provision for this be made by transferring the surplus on the year's trading and £1,707 from general reserve, reducing that account to £10,605.

West London & Provincial Electric & General Trust

An ordinary dividend is announced of 4½ per cent., less tax, making 9 per cent. for the year (against 10 per cent.). The carry forward is £3,819, subject to directors' additional remuneration.

Egham & Staines Electricity Co., Ltd.

The report for 1930 shows a profit of £44,273. After deducting loan interest, &c., it is proposed to pay a dividend of 7½ per cent., less tax, on the ordinary shares (same).

North Staffordshire Tramways Co., Ltd.

The revenue for 1930 was £11,560, and the balance available, £5.339. The ordinary dividend is 5 per cent. (same), leaving £539 to be carried forward.

Wood & Cairns, Ltd.

The directors recommend a dividend of 7½ per cent. on the ordinary shares for the past year. This is an increase of 2½ per cent. on the previous year's dividend.

Calcutta Electric Supply Corporation, Ltd.

The directors propose to pay a final dividend of 7 per cent. (actual) on the ordinary shares, making 12 per cent. for the year, and also a bonus in cash of 5d. per share, both less tax at 2s. 3d. in the £.

City Electric Light Co., Ltd. (Brisbane).

The report for the year ended January 31st last shows a net profit of £122,181, to which is added the balance brought forward, making £122,221. A final dividend of 4 per cent. is paid on the ordinary shares, making 9 per cent. for the year, and £51 is carried forward.

Stocks and Shares

Tuesday Evening.

On Friday in this week there is to be published the report of the Weir Committee, and advance anticipations of the contents of the document announce that the Committee will recommend that the whole railway systems of the country shall be electrified. To do this, the cost is estimated at 400 million pounds. Such an expenditure is sufficient to make the investor gasp, even though, nowadays, he is accustomed to think in millions where, before the war, thousands might have been considered extravagant. The scheme arrests attention by its boldness and its vision. Had it been promulgated a couple of years ago, when, as the saying goes, there was plenty of money about, and when the spirit of speculation charged the atmosphere, its reception might have aroused a gladder welcome than financial interests may be prepared to accord it to-day.

On the other hand, the financing of such a scheme would be done, no doubt, partially under Government guarantee. In view of the high levels at which British Government stocks stand at the present time, the difficulty of financing a scheme that involves so much money would be probably much less than at first sight appears likely.

Electricity and " Tube " Stocks

The standard of credit maintained by public boards is best illustrated by reference to the price of the 4½ per cent. debenture stocks of the Central Electricity Board, and of the London and Home Counties J.E.A. These stand at 95 and 95½, respectively, giving a return on the money of 4¾ per cent., which is, roughly speaking, no more than 7s. 6d. per cent. above that obtainable from British Government securities. These stocks carry no guarantee from the British Government. London Power 5 per cent. debenture is quoted at 103¾. There is very little stock of the Underground Electric Railways group on offer, the principal amount at the moment being £15,000 City & South London 4 per cent. debenture stock, obtainable at 83¾, which, at that price, gives £4 17s. 6d. per cent. Interest payments are due on May 1st and November 1st, and the price mentioned includes the 2 per cent., less tax, due next week. The stock is a full trustee security. There are smaller amounts of the Tube Railways T.F.A. stocks—the 4½ per cent. debenture stocks, that is, of Central London, City & South London, and London Electric Railways, all of which stand at prices giving a yield of £4 11s. 6d. per cent. Amongst the ordinary stocks, Underground Electric shares have reacted a trifle to 21s. 6d., at which price the yield on the money, assuming maintenance of the present-paid 8 per cent. dividend, comes to £7 8s. 10d. per cent. Metropolitans have gone back to 53½, Districts to 74½, both showing falls of a point apiece.

Cables and Wireless

The improvements noted a week ago in the prices of Cables and Wireless stocks have not been held, the group making, indeed, a very poor showing. The preference dropped 7⅛ points to 61½, and the ordinary stock 3½ points. Marconi Marines have given way to 36s. 3d., showing a fall of 2s. 6d., owing to the declines in Cables and Wireless stocks. Globe Telegraphs are 10s. down, for the same reason. Great Northern Telegraphs, at 29¾, are 15s. lower, by reason of the recent report, which showed that it was necessary to encroach upon the reserves in order to maintain the dividend at 20 per cent. The only improvement in this group is a gain of 10s. in Anglo-American Telegraph preferred, the price of which strengthened to 104. A certain amount of the 4 per cent. debenture stocks of the Eastern Telegraph, Eastern Extension and Western Telegraph Companies, has come to market, and can be bought at a price that yields about 5 per cent. on the money. In view of the liberal margin of security behind these stocks, both as regards interest and principal, the investment may be considered practically gilt-edged. A little business is in course in Anglo-Portuguese Telephone shares, the price being 19s. 6d.

American Telephone & Telegraph stock, at 194¼, is a shade harder. The company's quarterly report for the three months ended March 31st shows that the net income was equal to 2.51 dollars per share, as compared with 2.96 dollars per share in the corresponding three months last year. A quarterly dividend of 2.25 dollars per share is being paid. International Telephone & Telegraphs, at 32, are 3½ points down. The British Columbia Telephone Company's report for 1930 shows satisfactory expansion, and the 6 per cent. preference shares are a steady market at 102½.

Spanish Issues

Direct Spanish Telegraph ordinary shares at 7 have suffered a fall of 10s., but no business has been marked in them for over a year, when the last-recorded bargain was at 10½. The company's 10 per cent. preference shares of £5 each are 30s. down this week, the shares changing hands at 5½ and 5¾. Barcelona Traction shares, at 20½, have shed 2½. The prior lien bonds have fallen 4½ to 97½, and the first mortgage bonds at 42½, are 3 lower.

Manufacturing and Equipment

Electric Construction shares are 9d. better at 12s. 6d., but this is the only improvement which has occurred in the list of shares in the manufacturing companies. Telegraph Constructions further fell 10s. to 14. Enfields drooped to 4¼. Callender's are 3/16 down at 2 13/16. British Insulated gave way to 2¾. Babcock & Wilcox fell 3s. 9d., to 48s. 9d., on the reduction in the dividend from 15 per cent. to 14 per cent. Although the decline is a small one, it comes at an unfortunate time, for companies in the heavy groups are doing none too well. Telegraph Manufacturing (1929) shares at 1s. 9d. are unchanged. Ever-Ready shares are easier at 18s. 3d.

Dollar Stocks

Shawinigan Water shares have given way to 53, and Brazilian issues are mostly lower. Brazilian Traction ordinary shares, at 21½, are 1½ down. The price of the preference is left unchanged at 90. Rio Tramway bonds have declined in sympathy with the pronounced weakness shown by Brazilian Government issues. The company's 5 per cent. 50-year mortgage bonds are easier at 87½ though the first mortgage bonds hold their price at 101. Mexican Light & Power common shares have fallen 7 to 50½, and, although no other nominal changes have occurred in the prices of Mexicans, the tendency is heavy.

The Wall Street Stock Exchange is in a very unsettled condition, its anxieties being reflected in falls amongst shares of the various utility companies which are fairly familiar on this side. Power Corporation of Canada shares are 60, Consolidated Gas & Electric of Baltimore 95½.

Amongst other South American stocks, Anglo-Argentine Tramways 5 per cent. debenture has shed 8 points, going back to 32½, thereby losing most of the improvement gained by reason of the visit of the Prince of Wales to the Buenos Aires Exhibition.

London Electricity Shares Next Year

One of the principal firms of dealers in the Stock Exchange has gone to no little trouble in the preparation of a leaflet that looks ahead to 1932, and endeavours to foresee what is likely to happen to the dividends and yields on London electric lighting shares, under the operation of the provisions of the London Electricity Supply Act, 1925, that come into force at the end of the present twelve months. New standard prices will be fixed, to commence next January, and dividends on the ordinary shares of the group of companies operating under the Act will be reduced to a flat 7 per cent. per annum, plus a similar rate on any additional ordinary shares created by means of capitalising the special reserve fund for ordinary shareholders' benefit under the sliding scale. Eight of the principal companies are taken: Brompton, Charing Cross, Chelsea, City of London, Kensington, London Electric, St. James' and Westminster, and calculations are made as to what the special reserve fund, for the ordinary shareholders' benefit, is likely to reach at the end of 1931. The difference between the present dividend on 100 shares, and the estimated dividend on the ordinary shareholding, as it is expected to be after the end of 1931, is comparatively trifling.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price April 21 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—	5 0 0
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb. ...	Stock	—	—	94½		4 15 3
Charing Cross Ordinary	1	8½	8½	29/6	—	4 15 0
Chelsea	1	8½	8½	28/6	—	5 0 0
City of London	1	10	10	37/6	—	5 6 8
Clyde Valley	1	8	8	33/9	—	4 13 9
County of London	1	7	10	46/3	—	4 6 5
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	48/-	—	4 11 7
Kensington Ordinary	1	8	8	29/-	—	4 16 7
Lancs. Light and Power	1	7½	7	24/-	—	5 16 8
London & Home Counties 4½% Deb.	Stock	—	—	95½		4 14 6
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	40/9	—	4 18 1
Midland Counties	1	6½	7	28/-	—	5 0 0
Mid. Elec. Power	1	15	8	28/9xd	—	5 11 4
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6xd	—	5 6 8
do. 7% Pref.	1	7	7	27/-xd	—	5 8 8
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref. ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	28/6	—	4 18 3
Scottish Power	1	8	8	28/6xd	—	5 12 3
South London	1	8½	8½	28/-xd	—	5 0 0
Urban Ordinary	1	7	7	27/6	—	5 1 10
Westminster Ordinary	1	8½	8½	32/6	—	4 18 3
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/-	—	6 0 0
Yorkshire Elec.	1	8		32/6	—	4 18 6

Home Rails

Central London Ord. Assented ...	Stock	4	4	77	—	5 4 0
Metropolitan	,,	4	3½	58½	- 1	6 10 10
do. District	,,	5	5	74½	—1	6 14 3
Underground Electric	£1	8	8	21/6	—6d.	7 8 10

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	104	+½	5 15 6
do. Def.	,,	1½	1½	25⅞	—	5 15 6
Automatic Telephone	1	12½	12½	85/-	—	6 13 4
Cables & Wireless 5½% Pref. ...	Stock	5½	5½	61½	—7½	8 18 10
do. A 7½% Ord.	,,	Nil	—	21	—3½	... ...
do. B Ord.	,,	Nil	—	12½	—1	... ...
Globe Tel. and T. Ord.	10	10	—	11	—⅜	... ...
do. do. Pref.	10	6	6	10¼	—	5 15 6
Great Northern Tel.	10	20	20	29¾	—¾	6 14 5
Marconi-Marine	1	15	15	36/3	—⅜	8 5 6
Oriental Telephone Ord.	1	12	12	24⅜	—	*5 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	—	1½	—	... ...
do. do. 2nd Pref. ...	5	6	—	15/-	—	... ...
do. do. 5% Deb. ...	Stock	5	5	32½	—8	15 7 6
British Electric Traction Def. Ord.	,,	5	5	1325	—	... ...
do. do. Pref. Ord.	,,	8	—	131½	—	6 1 6
Brazil Traction	100	8	—	21½	—1½	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	97½	—	5 2 1
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	63½	—	6 6 0
Mexico Trams, 5% Bonds ...	—	5	5	50½	—	9 18 0
Mexican Light Common	100	Nil	Nil	50½	—7	... ...
do. 7% Pref.	100	7	7	72½	—	9 9 0
do. 1st Bonds	—	5	5	79	—	6 6 7
Victoria Falls Ord.	1	15	15	58/-	—	5 2 5
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies

		1928.	1929.			
Assoc. Elec. Ord.	1	6	6	21/6	—	5 11 7
do. Pref.	1	8	8	28/9	—	5 11 4
Babcock & Wilcox	1	18	15	48/9	—3/9	*5 15 6
British Aluminium Ord.	1	10	10	29/3xd	—	6 16 9
British Insulated Ord.	1	15	15	2¾	—⅛	5 4 4
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	2 13/16	—1/16	5 4 9
do. 6½% Pref.	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	1 7/16	—	7 1 5
do. 8% Pref.	1	8	8	29/-	—	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5½	5	12/4	+9d.	8 0 0
Enfield Cable Ord.	1	20	25	4½	—1/4	5 17 8
English Electric	1	Nil	Nil	6/3	—	... ...
do. do. Pref.	1	8	Nil	6/3	—	... ...
Ferranti Pref.	1	7	7	21/6	—	6 10 4
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	10	14	45/6	—	6 3 1
Henley	1	25	30	5½	—	5 6 8
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	5/-	—	... ...
Johnson & Phillips	1	10	10	36/9	—	5 8 10
Siemens Ord.	1	7½	7½	1 7/16	—	7 1 9
Telegraph Construction	12	10	10	14	—½	8 11 8

*Dividends paid free of Income Tax.

Our Foreign Electrical Trade

Electrical Exports and Imports during March

THE Board of Trade returns of this country's overseas trade during March show a general increase as compared with the corresponding month of last year. In the case of retained imports the decline amounted to over 24 per cent., while exports fell by nearly 37 per cent. Electrical goods and machinery contributed to these decreases; in fact electrical imports showed a proportionate decline (35 per cent.) greater than that in the general import total. Electrical exports registered a fall of about 28 per cent., which was considerably better than the general decrease. This downward tendency is no doubt due to the continued fall in price-levels but it is not wholly explained by this—there has been an actual shrinkage in volume as well as values. Reference to our monthly table, compiled from the official statistics, reveals that as compared with February both exports and imports show an increase, but this was entirely due to the difference in the length of the two months. Turning to the exports, it will be seen that the items mainly responsible for the fall of £444,913 in the total as compared with March, 1930, were electrical machinery (£186,537), insulated wires and cables (£186,666) and unenumerated goods (£97,819). The telegraph and telephone section provided a substantial offset to the general decline, amounting to £75,848, while carbons and arc lamps also recorded increases. The total exports for the first quarter of the year are about one-and-a-half millions down on last year's figures.

The very considerable drop in imports (£274,535) was spread over all items with the exception of arc lamps and non-submarine telegraph and telephone wires and cables, which were greater than in March last year. There was a very drastic reduction (£183,197) in imports of meters and instruments, which were at an abnormally high level in 1930, and the fall in machinery imports was also of some dimensions. The aggregate decrease during the first three months of the year has amounted to over £900,000, thus increasing the balance in our favour by over half-a-million sterling. The fall in the re-exports of electrical goods continued, the principal decrease occurring in telegraph and telephone apparatus.

The inset table shows that the decrease of £186,537 in the value of electrical machinery exports represented an actual reduction, the volume falling by 1,593 tons. Contrary to the general tendency the "unit" value actually increased from £155 to £184 per ton, *i.e.*, while the value fell by 33 per cent., there was a decline of 43 per cent. in the weight. It will be seen that Australia was principally responsible for the position, her share being reduced by over £100,000. So far this year there has been a decline from £294,650 to £58,896 in exports of this class to the Commonwealth. The 1930 total was nearly £200,000 below that for 1929. South Africa's purchases were halved, making a reduction in the total exports to the Union for the first quarter of the year of £85,345. European countries, which tended to become better customers during 1930, and raised the value of their purchases by £160,389, slacked off during March, while Japan's small share was still further diminished. The one bright spot was the rise of £14,601 in exports to Canada, and it would appear that this was due to machinery of a special nature, for the volume was less; the value per ton was almost double—£218 against £112. "Other countries" was the only other section which recorded an increase in value; in this case, too, the volume was lower, the "unit" price rising from £137 to £179.

Electrical Machinery Exports

Destination	Quantities			Values		
	Mar., 1930. Tons.	Mar., 1931. Tons.	Inc. or dec. Tons.	Mar., 1930. £	Mar., 1931. £	Inc. or dec. £
Europe	473	347	−128	95,220	72,865	−22,355
Japan	7	6	− 1	2,806	1,206	− 1,600
South America ...	306	206	−100	50,937	34,317	−16,620
South Africa ...	465	190	−275	65,996	32,610	−33,386
British India ...	535	420	−115	102,605	86,882	−15,723
Australia	944	161	−783	124,549	19,611	−104,938
New Zealand ...	253	207	− 46	38,841	30,758	− 8,083
Canada	219	180	− 39	24,681	39,282	+14,601
Other countries ...	483	377	−106	66,012	67,579	+ 1,567
Total ...	3,687	2,094	−1,593	£571,647	£385,110	−£186,537

	Exports.			Imports.			Re-Exports.		
	Electrical exports for March, 1931.	Inc. or dec. as compared with Feb., 1931.	Inc. or dec. as compared with March, 1930.	Electrical imports for March, 1931.	Inc. or dec. as compared with Feb., 1931.	Inc. or dec. as compared with March, 1930.	Electrical re-exports for March, 1931.	Inc. or dec. as compared with Feb., 1931.	Inc. or dec as compared with March, 1930.
Electrical goods and apparatus (unenumerated)	£193,160	+£45,316	−£97,819	£118,094	+£1 929	−£8,226	£5,881	−£3,319	−£2,485
Insulated wires and cables ...	118,502	− 55,698	− 186,666	57,133	− 588	− 15,242	218	− 1,004	− 131
Glow lamps	29,914	− 135	− 12,390	19.532	− 5.604	− 7,339	171	− 253	− 2,336
Arc lamps and parts	1,025	− 953	+ 10	3,847	− 578	+ 1,799	9	+ 9	+ 9
Batteries and accumulators ...	62,879	+ 12,655	− 20,886	40,889	− 8,255	− 5,486	326	− 103	− 492
Meters and instruments ...	23,933	− 5,365	− 11,104	32,033	+ 4,192	− 183,197	439	− 549	− 1,027
Carbons	5,537	+ 5,045	+ 5,379	17,575	+ 6,821	− 6,066	737	+ 656	− 167
Switchboards (not telegraph or telephone)	2,297	− 1,882	− 10 745	12	− 61	− 230	48	+ 48	+ 48
Electrical Machinery—									
Electrical machinery (unenumerated)	247,423	− 1	− 92,075	112,644	+ 2,837	− 46,808	13,170	+ 2,555	+ 4.191
Railway and tramway motors	7,160	− 6,879	− 9,974	—	—	—	—	—	—
Other motors and generators...	130,527	− 14 608	− 84,488	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	82,555	+ 25,741	+ 12,116	2,576	+ 325	+ 919	149	− 902	+ 107
Submarine telegraph and telephone cable	23,115	+ 20,239	+ 12,480	—	—	—	—	—	—
Telegraph and telephone apparatus	230,053	+ 31.877	+ 51,249	103,909	+ 805	− 4,659	8,699	− 40	−10,514
Totals...	£1,158,080	+£55,352	− £444,913	£508,644	+ £1,823	−£274,535	£29.847	−£2,902	−£12,797
Decrease for first three months of the year		Exports £1,493,480			Imports £926,330			Re-Exports £98,156	

The F.B.I. Mission to Canada

The Federation of British Industries' Mission to Canada, the members of which are Col. Sir James Lithgow, Bt., president of the Federation, Sir Arthur Duckham, G.B.E., deputy-president-elect, and Mr. Moir Mackenzie, left for the Dominion on April 18th. The Mission is going out at the invitation of Mr. Stevens, Minister of Trade and Commerce for the Dominion, and has been given great assistance in making its plans by the Canadian Government. The members of the Mission are anxious to find out as nearly as they can what views are held by leading industrialists and those behind industry. They believe that, given goodwill and confidence, much closer co-operation between industrialists in this country and industrialists in Canada is not only possible but necessary. After meeting Mr. Bennett, the Dominion Premier, in Ottawa, the Mission proposes to return to Montreal, and there carry out various meetings which have been arranged. It then proposes to go to Toronto to carry out a similar programme there. Finally, it is hoped to have a further interview with Mr. Bennett. On its return to this country the Mission will report to the Federation the results of its visit to Canada. If the Mission's report calls for subsequent visits to be paid to Canada by delegations representative of individual trades or groups of industries, the Federation will do its utmost to induce such trades or groups to despatch delegations with as little delay as possible.

The Situation in Australia

An Exhaustive Survey by the Senior Trade Commissioner

THE latest report by Mr. R. W. Dalton, C.M.G., Senior Trade Commissioner in Australia,* is a valuable treatise upon financial, economic, industrial and social conditions in the Commonwealth, particularly as they affect British trade and finance.

While the whole world has suffered during the past year or two, the effect of the universal depression has been intensified in Australia by internal factors. Mr. Dalton declares that the Commonwealth's post-war prosperity was not soundly based and he shows how the country is now having to pay for this. It is not possible here to do full justice to the writer's admirable presentation of the facts, but we may mention that he states the reasons for the high cost of production in Australia and the loss of Customs revenue upon which the Commonwealth depends so largely for its income, and he says that United Kingdom manufacturers must accept the fact that what was their second largest export market will offer a very reduced demand for their products over a number of years. He considers that the Customs tariff alone is not the cause of that reduction; the main causes are financial and a very heavy reduction would have occurred, tariff or no tariff.

A Gleam of Hope

It is inconceivable, however, that a country like Australia can continue indefinitely under such restrictions as she is now experiencing. Demand will return, even if it is not of such great dimensions as that of the last few years, and when it does return it is to be hoped that United Kingdom firms will again participate in its supply in proportions at least equal to those of the past. The present crisis should spur them to greater efforts to retain, and even increase, their share of the trade and the economic adjustments which have become necessary may develop a different attitude in Australia towards external trade. In that case it is not inconceivable that the whole outlook for United Kingdom trade may change and the future may be very much brighter than manufacturers at present seem disposed to anticipate. Further on in his report Mr. Dalton says that though extensive and severe consequences may follow the existing state of affairs, it would be foolish to imagine that Australia cannot emerge from the crisis, or that she will not emerge stronger and better able to compete in the world's markets. Whatever the difficulties may be it remains true that the country is only at the beginning of its development. Its present troubles are almost due to financial causes. Its power for production is unchanged and with a re-adjustment of values and a closer attention to scientific methods of production, there is still no reason why within a few years Australia should not again be well on the way to an era of very considerable prosperity.

The Manufacturing Industries

In spite of tariff increases in recent years, the progress of secondary industries in Australia has shown a marked slowing down; in fact the net production value of factories as a whole in 1928-29 was practically the same as in the previous year and there was actually a decline in production per head of population. The tendency has been for smaller works to increase considerably in number while the number of larger factories is decreasing. It would thus seem that such development as there has been in recent years has been in the branch of small-scale production rather than in that of large-scale manufacturing. Apart from factories concerned with food, drink, &c., the largest group is "metal works, machinery, &c.," which in 1928-29 was responsible for over 20 per cent. of the total net production. One of the chief difficulties with which secondary industries have been faced is the smallness of the home market and the fact that mounting costs of production have made it impossible to economise in overhead expenditure by the development of overseas markets. Now that the purchasing power in Australia has been considerably reduced, the effect of this limitation is being felt very seriously. The question of Australian production costs was dealt with in the last report of the Tariff Board in which it was shown that in many instances the prices of articles made in Australia were equal to, or in excess of, the landed cost of imported goods after taking a heavy duty into account. The Board gave as the causes high wages, lack of co-operation between employers and employés, high overhead charges and excessive distribution costs. Dealing with the establishment of Australian works by overseas concerns, Mr. Dalton mentions the proposal of a Dutch firm to establish a battery factory in Melbourne; the proposed manufacture of sparking plugs by German and American concerns; the project of a United Kingdom firm for the manufacture of certain classes of cables and wire in collaboration with Australian firms; the merger of important United Kingdom, United States and Australian interests to effect economy in the production of electrical equipment; and the amalgamation of United Kingdom and other interests to produce electric lamps. The last two refer to the formation of the Australian Electrical Manufacturing Co., Ltd., by the Australian General Electric Co., Ltd., Ferguson, Pailin, Ltd., and Metropolitan-Vickers (Australia) Pty., Ltd., and to the establishment of a lamp works at Newcastle (N.S.W.) for the production of standard makes.

Electrical Import Trade

The import trade of Australia in 1928-29 is analysed in the report and a section is devoted to machines and machinery (including electrical apparatus). Details of this trade were given in our issue of July 4th last (p. 38), but the principal features may be recapitulated. As regards the machinery imports as a whole the total value (£14,739,503) was slightly lower than in the previous year; Great Britain's share was valued at £7,017,896 or 48 per cent. (against 53.7 per cent. in 1927-28). The leading electrical item was electric cables and wires which declined from £1,721,688 to £1,317,115, Great Britain's proportion falling from £1,638,997 to £1,249,494. Imports of dynamo-electric machines declined in value from £955,249 to £746,292, and the United Kingdom's share from £667,792 to £512,936. Telephone switchboards, &c., also fell—from £731,700 to £297,155. Here there is a discrepancy, for the United Kingdom's share is said to have fallen from £682,629 to £311,488. Later information regarding imports is given in an appendix to the report; this covers the four months July-October, 1930, and compares the figures with those for the corresponding period of 1929. The statistics of electrical trade are reproduced below :—

	July-October 1929	July-October 1930
	£	£
Batteries and accumulators	192,369	21,287
Cable and wire, covered	456,329	328,018
Dynamo-electric machines	242,522	132,709
Lamps, filament, for lighting and heating	201,762	384,449
Telegraph instruments, &c.		
Telephones and telephone switchboards ...	89,184	53,207
Other	921,518	640,501

It is not stated how much of this equipment was supplied from the United Kingdom.

Competition

Mr. Dalton states that the trade of the United States in individual lines was well maintained. The movement of trade in this class confirms the opinion expressed in previous reports that tariff increases in Australia are likely to have a more serious effect on British trade than on that of her competitors. Great Britain's trade has predominated in the simpler classes of machinery whereas foreign countries have built up their trade largely in specialised lines, and these simpler classes of machinery would naturally be the first in which local industry would be protected. A division of the imports of this class into two sections, *viz.*, those in which United Kingdom trade predominates and those in which there is severe competition (chiefly from the United States), clearly illustrates this point. A table is given showing the goods in which there is severe competition, and it is seen that of the total of these goods the United Kingdom secured only 34.7 per cent. in 1928-29, whereas of the remainder of the trade in the class she secured 81 per cent. Among the items included in the table are batteries and accumulators (United Kingdom £271,566, United States £349,432, other countries £54,042); electric heating and cooking appliances (United Kingdom £33,863, United States £39,162, other countries £31,918); electric filament lamps (United Kingdom £296,396, other countries £368,026); electric measuring and recording instruments (United Kingdom £72,598, United States £39,781, other countries £42,191); radio receiving sets (United Kingdom £85,325, United States £250,874, other countries £62,823); radio valves (United Kingdom £60,709, other countries £164,452); unspecified electrical appliances (United Kingdom £197,440, United States £150,808, other countries £94,092). The opinion is expressed that it is in this section and in the section "metals and metal manufactures other than machinery" that Great Britain's chief opportunities to expand her trade with the Commonwealth seem to lie.

Miscellaneous

Among the legislation or projected legislation of the past year the report mentions the Electricity Commission Act passed by the Victorian Legislature; this provides for the construction and operation of tramways by the State Electricity Commission. The same State has under consideration a Bill aiming at the establishment of a Ministry of Transport to co-ordinate the railway, tramway, and road services. Reference is also made to the Queensland Industrial Conciliation and Arbitration Act, which abolishes the Board of Trade and Arbitration and substitutes an Industrial Court presided over by a Supreme Court judge.

With regard to radio broadcasting, the report states that there are now ten "Class A" stations and about 30 "Class B" stations, and during last year contracts were let for several relay stations. At October 31st last the number of listeners' licences in force was 329,627—an increase of about 20,000 since the corresponding date of 1929.

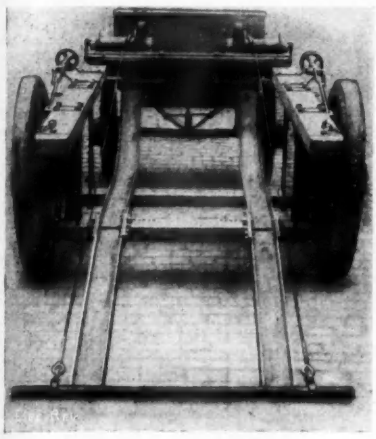
* Published by the Stationery Office for the Department of Overseas Trade. Price 3s. 6d. net.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Cable and Transformer Wagon

We learn that the No. 53 cable and transformer wagon of S. RAWLINSON, LTD., Audley Range, Blackburn, has been remodelled. It will carry drums and transformers of any size up to 8 ft. diameter and 4 ft. wide and weighing up to 8 tons. The load is carried on strong springs without any undue strain over paved or rough roads. For any size drum only two men are required. It is claimed that an 8-ton drum or transformer can be loaded or unloaded within 3½ minutes without any undue exertion. The channels carrying the drums are fixed on an incline of 2 in. in 8 ft., and unloading is practically by gravity. Drums require no setting at the starting point as the two separate winches will pull the drums from almost any angle.



Rawlinson Cable Wagon

Mine Lighting Cable

One result of the efforts that are being made by the Safety in Mines Research Board to render possible the efficient usage of electric lighting at the coal faces in mines is the invention of a special cable by DR. G. ALLSOP, of the Board's staff. The ordinary supply cable is surrounded with a number of thinner cables carrying a very small current. If one of the pilot wires becomes fractured as the result of a roof fall, &c., the main lighting circuit is immediately broken before the conductor proper is damaged, thus preventing a dangerous spark from the latter. While the current in the pilot wires is sufficiently large to operate the necessary equipment to cut off the lighting supply, it is not large enough to provide a spark on rupture with sufficient energy to ignite firedamp.

A Dental Engine

The "Radex-Dental" machine recently introduced by Messrs. HENRY KALB, 4-5, Warwick Court, High Holborn, W.C.1, is claimed to fulfil every modern need in dental practice. The motor is suitable for use on either a.c. or d.c. and is encased in durable rubber-free shock-proof insulation material, so that all the working parts are protected against the accumulation of dirt and dust. The outside appearance is very pleasing and neat. The working spindle is at right angles to the motor shaft, to which the flexible shaft is coupled. The drill chuck is provided with a patent "Duplex-Quick-Coupling" which can be easily detached. The machine can also be used for vertical precision drilling, for which purpose a sensitive spirit level is provided at the motor head, a handle, and an interchangeable chuck. The machine weighs 2¼ lb.

New Impregnation Material and Method

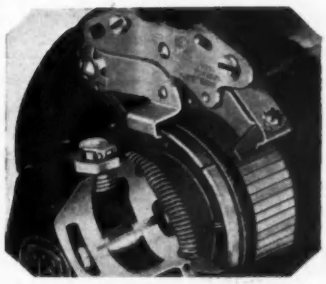
An invention recently successfully put through its first practical test at the East Pittsburgh, Pa., U.S.A., works of the WESTINGHOUSE ELECTRIC CO. consists in the new application of a new insulation material, called solventless varnish, which completely fills the pores of the fibrous material between the wires and becomes a solid integral part of the electrical apparatus. The application is similar to the usual vacuum-pressure impregnating process, but it does not require any additional equipment; in fact, several parts and operations are eliminated. The success of the scheme seems to lie chiefly in the claim that the varnish is completely solventless, so that air holes are not formed by evaporation. It is said that tests show that the new process and material will probably increase the life of insulation about 25 per cent.

Shaft Cables for Hot Situations

It is well known that paper-insulated shaft cables have to be specially freed from excess of oil; otherwise a hydrostatic pressure will be developed at the lower end of the cable. In deep shafts this pressure may be sufficient to cause considerable difficulty both in jointing and in maintenance, the trouble being accentuated in shafts where high temperatures are encountered. BRITISH INSULATED CABLES, LTD., have recently supplied some cables specially designed to meet such conditions. The process adopted, which is provisionally protected, enables them to guarantee that the cables will not "bleed" under the most severe temperature conditions met with in practice.

Special Silent Motors

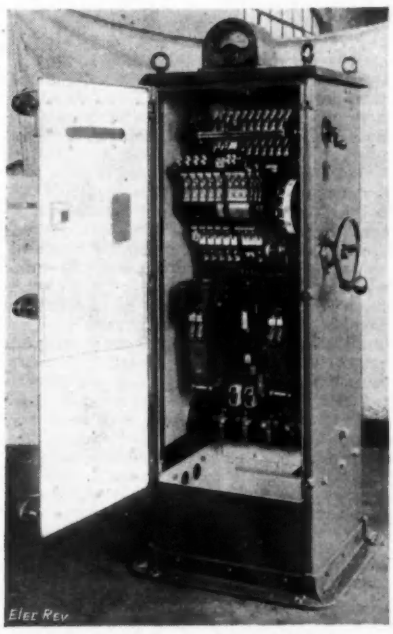
POWER CONTRACTS (BATWIN), LTD., 138, Southwark Street, S.E.1, have introduced a new design of small motor which is claimed to be particularly suitable for refrigerator and similar work on account of its silent running. The motor is slung in a cradle which is spring-mounted so that all the energy which would normally be transmitted through the motor casing, &c., giving rise to vibration and noise, is absorbed by two circular springs at either end of the rotor-shaft housing and two other springs in the base. It is supplied in a range of from ⅛ to ¼ h.p. for voltages of 100-120 and 200-240 and a speed of 1,425 r.p.m. The new design incorporates simple and efficient brush-lifting arrangements; the whole of the mechanism and brushes can be removed in a couple of seconds by the removal of two screws. The lifting device is operated by a flange which forms part of the short-circuiting apparatus, and is made to move out against centrifugal force, carrying the brush-operating lever with it. This lever has a pin mounted upon it and is slotted to receive two thin steel plates which, by reason of their displacement, raise the brushes into a definitely locked position. The direction of rotation can be reversed by merely moving the brushes over and replacing the screws.



Arrangements of "Batwin" S.M. Motor

D.C. Motor Control Gear

A range of control pillars for d.c. motors for marine and industrial purposes has recently been introduced by ALLEN WEST & CO., LTD., Brighton. It is made in two types, constant speed (M S) and variable speed (M R), and both styles incorporate a drum-type starter, a d.p. contactor-type circuit breaker with an adjustable overload time-lag relay, and a one-minute-rated starting resistance. In addition each variable-speed equipment includes a shunt field regulator and a shunt regulating resistance. An isolating switch and a moving-coil ammeter can also be incorporated in either type when desired. The cases can be arranged for bulkhead or wall fixing, or provided with pedestals for deck or floor mounting. The apparatus was primarily designed for marine use, and since it was first put on the market it has been installed on the ships of over a dozen of the leading shipping lines, in particular the *Empress of Japan*, the *Anshun*, *Princess Helene*, and *Empress of Britain*. The last three vessels are equipped practically throughout with Allen West control gear. The demand for this gear has until recently prevented it being put forward to any great extent for land use, but it is now available for machine tools and similar applications, and a considerable number of equipments has been supplied. A recent important installation is that for the Southall gas works, for the Gas Light & Coke Company, where 27 pillars are being installed. The features aimed at in the design of this apparatus were on the one hand by employing robustly designed units—actually standard Allen West controller and contactor units are employed—to give a robust design suitable for the most severe service, and further to render the apparatus readily accessible by making the whole interior framework on which the units are assembled removable from its case.



Allen West D.C. Control Pillar

The Societies and their Doings

A Home Office factory inspector's views on illumination; a review of large power transformer progress; electric and compressed-air mining drills compared; and the summation metering of energy.

The Benefits of Good Industrial Lighting

THE importance of good lighting, the general principles to be observed, and the industrial benefits derivable therefrom are outlined in the paper MR. D. R. WILSON, C.B.E., M.A., H.M. Deputy Chief Inspector of Factories, read before the ROYAL SOCIETY OF ARTS in London. During recent years no industrial subject has received more attention than lighting and the rapidity with which it is now developing is perhaps not generally realised. Regarding adequacy, he does not think that there is much to complain of in existing practice. Light is still a cheap commodity, and as a rule sufficient is provided for the work. Nevertheless, there is evidence that beneficial results sometimes follow when the illumination is raised to a value far higher than that which is commonly found in practice to-day. Where illumination most frequently fails in adequacy is in the lighting of big open spaces, passages, and other parts of a factory in which productive work is not done.

In some processes the detail to be distinguished is so fine that, however high the illumination may be, the eye has nevertheless to be kept close to the object being worked on, with the result that some degree of continuous strain is imposed on two of the ocular muscles, those of convergence and accommodation. Experiments clearly suggest that in such processes benefit will be derived from the use of spectacles specially prescribed to relieve and restore the eye to its normal condition. Faulty design is much more common in respect of the suitability of the installation than in the adequacy of the illumination provided; the two main defects may be described as glare and shadows. Shadows, however, may often have a beneficial effect; in material of a uniform colour, for instance, the detail is seen by means of the shadows cast by the miniature ridges on the surface of the material, and a system of lighting which casts no shadows, such as the so-called indirect system, is unsuitable for work where such material is used.

It is, in fact, common sense to acknowledge that ability to see clearly is an aid to accident prevention, while good lighting is an important aid to production as regards both quantity and quality. In weaving, for instance, where daylight conditions are specially good, production has been found to fall by five to ten per cent. during the period of artificial light. In printing, again, the output in a composing department has been found to increase (and the errors to decrease) almost in proportion to the illumination provided, and this experiment suggests that maximum production is not attained until an illumination far higher than that usually found in practice is reached. It has been calculated that the additional cost of providing the higher illumination would be more than offset by the higher and better standard of work. It also has a definite psychological effect on the worker, in that it tends to increase the cheerfulness of his environment; even in a rough process for which a high standard of lighting is not required for the work itself output nevertheless increases as the lighting conditions are improved. Lastly, good lighting is an aid to cleanliness and order. The theoretical requirements of good lighting are very simple; in practice, however, whilst there are certain fundamental conditions which every good system should fulfil, cases of difficulty frequently arise, which can only be solved by the method of trial and error; in factories often every canon of good lighting has been broken simply owing to want of sufficient thought and lack of expert advice before installation work is begun.

Recent Progress in Large Transformers

IT is interesting to note from the paper read before the INSTITUTION OF ELECTRICAL ENGINEERS by MR. R. M. CHARLEY, B.Sc., that, while transformer size (capacity) has increased four-fold during the last five years, voltage has not increased since 1920. At present problems connected with the transmission line itself limit pressures, but when higher voltages are demanded designers will have no hesitation in offering to build the necessary transformers.

Perhaps the most serious restriction limiting size is that of transport; weight is very much affected by the present general practice of shipping transformers complete with oil, which is sound, for a transformer with its large amount of insulation must be most carefully dried out, which can best be done at manufacturers' works. Vehicles are now available for transportation by rail and road of loads up to 120 tons, and it has been borne in mind that usually no crane will be available for unloading on site. On the London, Midland and Scottish Railway's 120-ton trolley the load is distributed on 12 axles mounted on four bogie trucks joined in pairs by a member swivelling on each bogie, and the main girder is supported at its ends and arranged to swivel on these two members; in spite of the great length of the trolley, ordinary curves can be negotiated, and loads can be transported as normal goods traffic. The transformer hangs from brackets near the top of its sides, and the bottom can be brought within a few inches of the track; in this way the maximum advantage of the loading gauge is secured. Incidentally, the inherent proportions of large 3-phase transformers admirably suit the general limits of this means of transport. To facilitate unloading on site, the sides of the main girder are detachable, so that, after the transformer has been jacked up just sufficiently to take the weight off the girder, the whole trolley can be removed and then the transformer is rolled to its final position. Similar trolleys have been built by the other big railway groups, while on the Continent a unique method of transport has been developed. The tank itself is designed on the lines of a bridge girder to which temporary cantilever members are bolted at each end to transmit the weight to bogie trucks of usual design.

Facilities for road transport have increased probably more in this country than in any other part of the world, and road-haulage contractors are now prepared to take loads up to 120 tons, and some wonderful feats of road haulage have recently been accomplished. A vehicle owned by Messrs. Norman E. Box, Ltd., has 32 double rubber-tired wheels. When it is necessary to reduce the weight for transport to the very minimum, the tank may be filled with dry air under pressure; if the transformer is to be delivered overseas the pressure of air at the outset must be determined by considerations of climatic conditions through which it must pass. A number of transformers have already been shipped from this country in this manner with satisfaction, a refinement being to fill the tank with an inert gas. The use of the latter in conjunction with oil under service conditions is known as the "inertaire" method in America. The tank is not full of oil, but the space allowed at the top is maintained full of an inert gas. Breathing takes place in the usual manner, but the breather itself is a special device which takes the oxygen out of the air as it is being drawn into the tank. In addition to eliminating the risk of chemical action, it is also claimed that the gas-filled space above the oil has a cushioning effect in the event of any disturbance causing a sudden increase of pressure, and thus reduces the risk of damage to the tank. Transformers of this type totalling several million kVA are in service, but the more common practice is the use of an expansion vessel which has been proved to give most satisfactory service.

The relative advantages and economic uses of 3-phase units and banks of single-phase units are discussed, and it is shown that, while in America the latter arrangement is still popular, in this country and on the Continent 3-phase units are now almost standard. The author also shows that the core type of construction is becoming the most usual for both single-phase and 3-phase units, but for certain special applications the shell design may be preferable, and it is shown that natural cooling, with or without auxiliary air blast, is now supplanting older water-cooling arrangements. An interesting protective scheme known as the Buchholz is described. It is essential that transformers shall withstand transient surge conditions, and the author suggests that transformers built with inter-turn insulation according to a proposed new British standard specification will be quite satisfactory in service, and cheaper and less complicated than for a "non-resonating" transformer. Problems connected with short-circuit conditions in a star/star-connected transformer with tertiary windings are touched upon; examples are also given of transformers having three or even four windings for useful power supply. As regards on-load tap-changing, the author shows that the parallel-winding scheme has become almost obsolete in favour of the mid-point auto-transformer arrangement. A description is given of a booster transformer arranged to simultaneously control both voltage and phase angle, as is now necessary for the most efficient operation of large power networks. In view of the growing demand for current-limiting, the author describes a type of oil-immersed reactor which is becoming popular and is displacing the older concrete type of construction. In order to present a picture of the stage now reached in transformer construction, the author has collected technical data concerning a number of outstanding transformers built in recent years by manufacturers throughout the world.

MR. J. R. BEARD remarked that transformers of 30,000 kVA or over each that had been, or were being, made in this country aggregated some 3.5 million kVA. Many of them were in service and confidence in the larger sizes was increasing, which should cheapen line construction by reducing fuse and switch complication. Mass production was so important a factor in America as to make a change-over there from the single- to the three-phase type difficult; apart from cost, the three-phase type had many incidental advantages. More had been done in Britain with on-load tap-changing than anywhere else in the world, but whether it was worth while continuing to spend half as much again as the cost of the transformer on regulating gear needed serious consideration. The Buchholz relay was attractive theoretically, but application conditions differed in England; by its application on the Continent trans-

former insurance rebates were obtainable. Though the paper revealed British transformer makers' achievements, points that needed further attention included oil-tightness, noise, interchangeability restriction by foundation complication, and switching-in kicks.

MR. A. J. ELLIS did not consider it economical to design the transformer tank as part of the railway truck. The single-*versus* three-phase question was largely one of space occupied, and space was valuable in England. There was no such question as shell *versus* core types; it was really one of wound *versus* rectangular coils.

MR. H. S. HOLBROOK thought that core cooling slots as shown in the paper would be expensive. Buchholz protection was not convincing and he doubted whether it was worth its cost at present. Non-resonating transformers were not more complicated, though they made design-office work more arduous; if more expensive, it was an insurance, and two million kVA of that type was in use. The proposed B.E.S.A. inter-turn specification should be adopted generally as the standard.

MR. R. O. KAPP said that much of the complication was due to means of getting rid of the heat generated and of varying the transformation ratio for regulation purposes. The cost of the latter could not be considered a burden if it were compared with the cost of the whole system it regulated rather than with that of the transformer it was applied to. What was the practical limit of power transmission? Present voltage limits were ± 10 per cent., but those might become too conservative in a few years time.

MR. R. H. ABELL referred to possible methods of reducing noise and the complexity of construction; a 10,000-kVA. 30,000-V transformer had 37 separate parts and was made of 42 different materials. The shielded winding had advantages.

MR. E. T. NORRIS referred to the number of tap-changing sets in use and thought the author had been too severe on the parallel-winding method. His firm was the only one that used both, depending on the working conditions; complication was not introduced as the larger transformers had to be divided in any case to reduce eddy losses, and both methods needed protection against incomplete change-over. The choke-coil method was good, indeed, for bolt and nut makers; the spheres of application of the two methods overlapped very little and, apart from grid transformers, equal numbers of the parallel-winding and choke-coil types had been supplied. If there were any limit to size, it would be imposed by electrical stresses in the cores, not by cooling, eddy loss, or mechanical considerations. However, Mr. Porter divided his cores up into a number of smaller ones, so that even that limitation did not exist at present.

MR. J. L. THOMPSON thought some of the author's comparisons misleading. The latest developments in the U.S.A., Canada, South Africa, New Zealand, and Russia had been with the single-phase type; the adoption of the three-phase type was not rational, having been forced by competition and had therefore been speculative. It had been a question of price, and consultants might have given more consideration to the inside of the transformer. Buchholz protection had been over-rated; it was applicable only where other systems were impossible.

MR. J. VENTERS was not clear how the author's flash-over values of adjacent line insulation were to be interpreted.

The author replied briefly.

Drills and Drilling as Applied to Coal Mining

SOME interesting comparisons between compressed-air and electric drilling in mining work were made in the paper by MR. D. Y. MARSHALL read before the London branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS. The direct application of electric power to a rock drill was a much older problem than most people realised. At least 40 years ago solenoid drills were being made, but due to the rapid reversing of the current through the coils they became so hot that it was not possible to employ them in small headings. The design of reciprocating electric rock drills still awaited a satisfactory solution. The electrical engineer had had to content himself with a purely rotary machine, and it was drills of this class which were being offered to collieries in competition with the air-driven hammer drill. On the Continent, where the coal was very soft and very little stone was encountered in the mining of it, a drill with a purely rotary motion had very quickly established itself, the best drilling method undoubtedly being a rotary motion applied to auger steels, thus bringing the cuttings away from the bottom of the hole as fast as they were made. That advantage fell off rapidly as the material to be drilled became harder, when other methods had to be employed. The hard coal and shale bands in our mines had just about that degree of hardness at which the two types of machine began to draw even. If both drills were hand held, it would be difficult to say which would be the faster; while a mounted electric drill would perhaps out-drill the other by 50 per cent., that advantage would be more than eaten up by the loss of time in fitting and setting up, and also by the fact that the mounted drill would usually require two men to operate it.

The h.p. delivered at the end of the drill shank of the average hammer drill worked out at approximately 1 h.p. The operation of such a drill should require about 40 cu. ft. of free air per minute at a pressure of, say, 90 lb. per sq. in. Assuming single-stage compression and an electric motor efficiency of 95 per cent., the input to the motor to give the required capacity would be 8¼ h.p. (5 per cent. loss between the compressor and the drill), so that the efficiency of the air drill would be about 12 per cent., or 7 or 8 per cent. if steam-driven compressors were used at the surface. An electric drilling machine to do the same amount of work, provided the material were not too hard for it, would require an input of only about 1¾ h.p., and the cost of running the electric drill was all in its favour. The work performed by a hammer drill was not equalled by any other piece of machinery, but many examples could be cited of the cost of spare parts for the first three years not exceeding an average of 15 per cent. per annum on the first cost. The upkeep cost of electric drills might be regarded as equal to, or higher than, that of air machines, depending on the difficulties of drilling encountered. A clutch would cause more than its share of trouble, and the electric drill was not as accessible as the air machine. Comparing all-in costs (including the cost of the power plant required to generate the air) a mine car compressor plant, complete with two hand drills, hoses, and steels, would cost about £400, and its useful life would be about from 8 to 10 years. Two electric drills, either mounted on columns or a small truck and short columns suitable for doing similar work, could be supplied for a little over £300. It would be too optimistic, however, to expect electric drills to have the same life as air drills and the shorter period in which the electrical plant had to be written off made little difference between the initial costs of the complete equipments. There was a strong desire on the part of a section of coal mine management to supersede the compressed air drill by an electric machine, but the latter would only justify itself when it could do all the drilling, whether in coal or stone, at a cost at least equal to that of compressed-air drilling.

In the course of the subsequent discussion MR. A. E. DREW said that the cost of running a compressor with an input of 8 h.p., as compared with an electric drill of 1¾ h.p., was such as to give a tremendous advantage to the electric drill; maintenance and first costs were comparatively small, as compared with power costs, so that if an effective electrical drill could be produced it would be adopted because of its lower running cost.

MR. J. W. GIBSON (president of the Association) said that electrical engineers had overcome greater difficulties than those associated with drilling. For example, not many years ago electric colliery winding had been regarded as impossible, but it had been made an economical proposition.

Metering Current-transformer Summations

A PAPER read at the April meeting of the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS by MR. E. W. HILL, M.I.E.E., and MR. G. F. SHOTTER, A.M.I.E.E., deals with the summation metering of multi-feeder supplies of electricity by paralleled current transformers, with special reference to the errors likely to result and to suggested methods of obviating them. It can be said at once that one method of avoiding "paralleling" errors, which is feasible on 2-feeder systems, is that whereby the paralleling of the two secondaries is eliminated by having them, instead, separated electrically and connected to two interlaced windings on the series system of an integrating meter, or other measuring instrument.

The theoretical aspect of the effect of an idle transformer in a pair which is paralleled is discussed and a method of anticipating the errors by calculation is proposed. The authors describe experiments made to ascertain the errors under working conditions and to demonstrate the efficacy of one means of avoiding them, *viz.*, by the use of interlaced, but separate, series coils in instruments. The more general cases of unequal load sharing, both at uniform and at diverse power factors, are considered from a theoretical point of view, and experimental test-results are recorded. A special 8-feeder summation metering scheme is described, showing the possibility of achieving such a summation very accurately by comparatively simple means. The last section of the paper contains a description of a special mumetal summation transformer used in this scheme, and test-results showing the perfection of its performance characteristics. The experiments are considered to have proved conclusively that such a transformer is capable of being made an exceedingly accurate instrument of summation under all conditions of loading. It is clear, too, that it furnishes a method capable of almost indefinite extension, since the number of primary windings can be increased beyond three and, by successive "cascading" to more remote summation transformers, the final summation can conceivably be achieved for anything up to 80 or 100 feeders, for example.

The authors express acknowledgments to Capt. J. M. Donaldson for permission to incorporate in this paper information and experimental results obtained in the laboratory of the North Metropolitan Electric Supply Co., and to Mr. F. R. Butherus, of the British Sangamo Co., for valuable assistance.

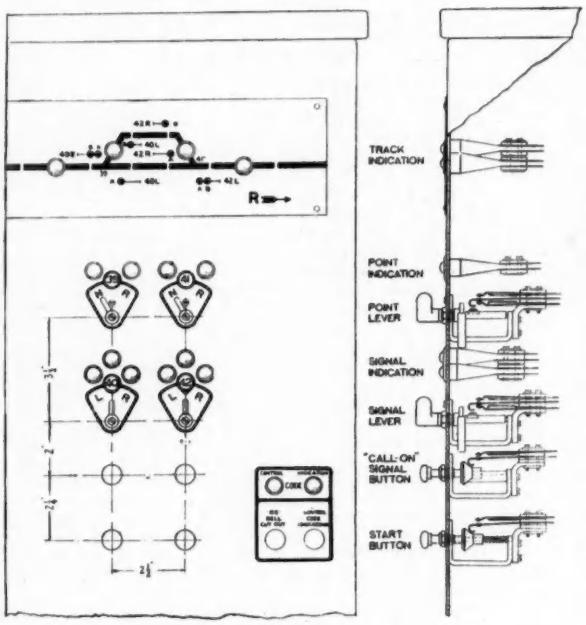
Railway-traffic Control

A centralised system of control now being introduced in this country will deal with up to 100 miles of track, embracing 81 signal stations

Control Machine for 10 Switches and 14 Signals

A SYSTEM of centralised railway traffic control which is being introduced into this country by the Westinghouse Brake & Saxby Signal Co., Ltd., is designed for the operation of all the points, signals, switch locks, &c., along a stretch of track to be controlled by an operator at a single point, and for return indications to be given to the operator of the state of track circuits, signals and points.

The system embraces two separate methods, *viz.*, the time code which has been developed to deal with a total of 35 stations on one pair of line wires, and the circuit code which provides for a maximum of 81 stations on three wires. The distance of the furthest station from the control point is limited only by the line resistance and insulation. A station may be considered to be a one-point lay-out, either a single end or a cross-over, with two track circuits and a complement of signals for directing the traffic in either direction. Both methods have one main feature in common; to make any traffic move at an outlying station the operator sets appropriate thumb switches on the control machine, and the instruction and station call are transmitted over the line wires in the form of a complete code.



Control Machine Panel Lay-out

Installations involving over 100 miles of line are giving satisfactory performance. The line current is about 120 mA, constant load, with all the relays in series.

Seven openings of the normally closed circuit occur in each complete control code time (outgoing), and eight openings in each complete indication code time (incoming). The open-circuit and line-closed periods can be either long or short.

The first step, a line-open impulse, prepares all stations for the reception of a code; impulses 2 to 8 are used to call the particular station wanted, the second step being "line closed," the third "line open," &c.; impulses 9 to 14 are used for transmitting control orders for the functions at the station called, or in the case of incoming codes to bring in a complete set of indications of the result of the performances.

The time taken for the transmission of a complete code is approximately 3½ seconds. The impulses and their duration are determined entirely by the relays housed in the control machine and in the station storage units.

In the circuit code method each code comprises a series of eight characters, the term indicating whether one wire X, a second wire Y, or both wires together Z, are open-circuited during an impulse. All characters are of equal duration.

The stations are called by character, each station having a call sign of four letters made up of only X, Y and Z, the total number of four-letter "words" which can be made up from these three characters being 81. The first impulse in a control code is always Z, and the second, third and fourth impulses are the first three letters of the call sign of the station wanted. The final letter of the call sign is sent on the last impulse, the fifth, sixth and seventh impulses being used for control code transmission. For an incoming code the first impulse is always X or Y.

The second, third and fourth steps are the first three letters of the station's call sign for panel selection, the last letter of the call sign being sent on the last step. The fifth, sixth and seventh impulses are used to give an indication of the result of the operations.

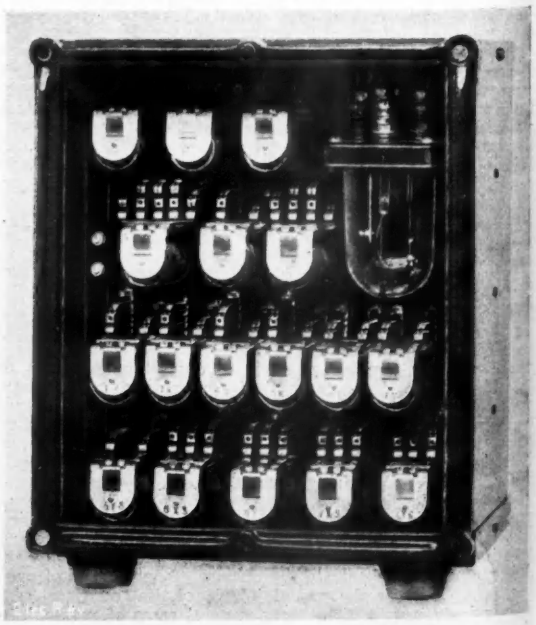
In both methods if two or more outlying stations commence to transmit incoming indications simultaneously, the nearest station takes precedence, cutting out the more distant stations which store their codes until the line clears.

The storage avoids the loss of indication which would otherwise occur if a train passed over a short track circuit during a time when the lines were fully occupied with control codes. In such a case the field storage units from the outlying station send in the "track occupied" indication as soon as the line clears, and follow this immediately with a further "track clear" indication, thus ensuring that the train graph at the control station correctly registers the passage of a train.

The relays in the coding units handle only the very small currents necessary for control purposes, and are therefore of small design. Power for the code relays at the control end and the relays, &c., at the stations is provided by small batteries.

The control machine is a sheet-metal desk-type cabinet having a number of thumb switches and press buttons mounted on the front panel and a number of indication lamps, some of which are located in a track diagram to indicate the track circuits, and some over their respective thumb switches to indicate the state of functions controlled. The control-board panel also has additional lamps, one of which shows that a control code is being transmitted and another that an indication code is being received. Built into the flat portion of the control machine is the train graph recorder, with a number of pens which respond to the condition of certain selected track circuits in the control area. The relays, &c., are housed in cases in a minimum of space, and all the relay wiring is completed in the cases before despatch from the factory.

The station storage units are fitted with the terminals which form the connecting link with standard signal circuits connected to signal, point-control and indication relays of standard patterns. Thermal cut-outs are used to protect point machines against prolonged running on the clutch.



Station Storage Unit; Thermal Cut-out Top Right

An Inverse Time-lag Relay

A New Design to meet the Increasingly Exacting Demands of Modern Protective Systems

THE induction-type inverse time-lag relay here described is the latest addition to the low volt-ampere class of instruments introduced by Everett, Edgcumbe & Co., Ltd.; it has a consumption of less than 2 volt-amperes and presents a number of other novel features. Fig. 1 shows the single-pole leakage pattern, and fig. 2 the three-pole overload pattern. Fig. 3 gives the time/current curves for various short-circuit time settings up to 2 seconds, but any intermediate settings are available by merely rotating the time-setting disk. It will be observed that the curves follow each other exactly at all currents and with all settings, so that the desired time discrimination is maintained, no matter how great may be the severity of the fault. Further, above six times the current for which the relay is set the time lag is entirely independent of the value of the fault current, the time lag having for each setting a definite minimum value below which the relay will never fall, no matter how severe the fault. Without this feature the time lags for the various settings approach one another so closely as to destroy all discrimination with heavy overloads or faults.

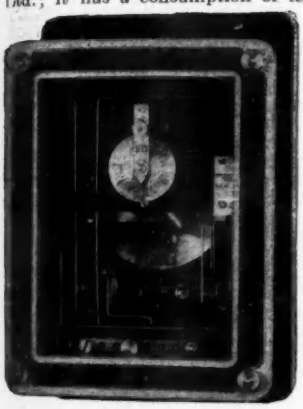


Fig. 1.—S.P. Leakage Relay

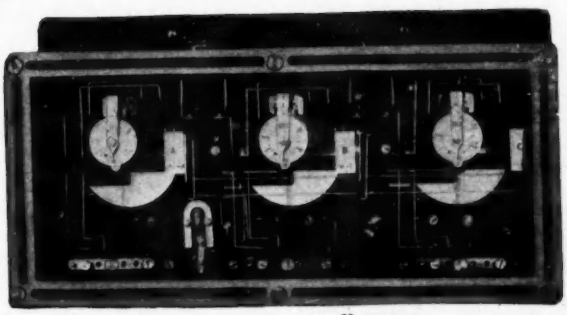


Fig. 2.—Three-pole Overload Instrument

The effect of temperature on the new relay is entirely negligible, the operating current being affected to the extent of less than 0.25 per cent. for a change in temperature of 20 deg. C. up and down. This advance, as well as a similar improvement regarding the effect of variations of temperature on the time lags, has been effected by applying the same principles of design to this relay as enabled the makers to produce induction ammeters and voltmeters which comply in all respects with B.S.S. first-grade instruments (ELECTRICAL REVIEW, July 29th, 1927, p. 173).

The change from one current setting to another is effected by screwing a plug into the appropriate receptacle in the range block. The plug is thus securely held in place instead of being merely pushed in, with the risk of working loose or even falling out altogether. Further, the change is automatically effected without the risk of breaking the secondary circuit of the current transformer and, in fact, without throwing the relay out of action, even momentarily.

The clear and open time scale, figs. 1 and 2, is instantly adjustable and clearly visible from outside the case. This scale may be graduated either in "nominal" time-lags or in definite minimum time-lags. The latter graduation is recommended as being the quantity of real importance from the protective standpoint, since the more old fashioned "nominal" value merely corresponds to one particular current just greater than that for which the relay is set. Each relay carries a time curve and table giving the operating times under various conditions of setting, fault current, &c.

A further important feature of the design is that the restraining force is supplied by gravity and not by a spring. This ensures that, when once the relay has commenced to operate, it will continue to move steadily forward so long as the fault current persists.

Six current ranges can be provided; settings of 75, 100, 125, 150, 200 and 250 per cent. full-load current are convenient, but others are available, if desired. The 100 per cent. point usually corresponds to 5A, but for earth-fault protecting it may conveniently correspond to 1A, or even less.

A further advantage lies in the arrangement of the windings, such that the operating forces are precisely the same at all settings, thus ensuring absolute similarity of the time/current curves for all current settings, throwing the minimum burden on the current transformers at all loads, and avoiding the heavy strain thrown upon the relay by a short-circuit, such as is inevitable when the settings are obtained by increasing the control. As will be seen from fig. 2, an indicating shutter can be provided which drops so soon as the relay has operated, thus showing in which particular circuit and phase a fault has occurred. The contacts are available either to close or open the trip circuit, and they can be arranged for self-resetting or hand-resetting, as preferred. In spite of the low volt-ampere consumption of these relays particular care has to be taken to make them robust and free from all liability to derangement when being moved about on truck-pattern switchgear.

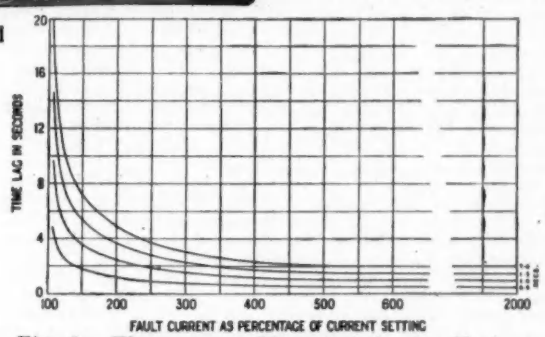
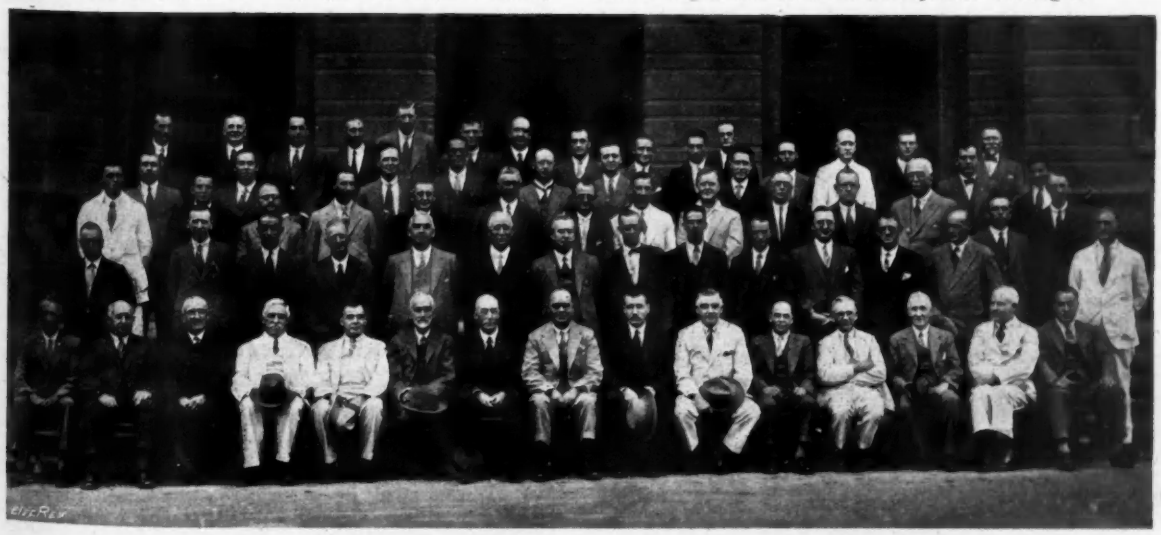


Fig. 3.—Time-current Characteristics for Various Settings



South African Municipal Electrical Engineers at Pretoria **(see p. 718)**

Sidelights of the "Talkies"

Recent Electrical Developments

MANY matters of interest to the electrical engineer are cropping up with the continued evolution of the kinematograph. These are quite apart from studio illumination and picture projection, which may be said to represent the power side of the question. The production of films, especially with the growth of "topical" or news pictures and in view of the popularity of sound, has given wide scope for electrical invention and constructive work.

Kinematography is just now going through some very important changes, of which little may appear on the surface. On one side efforts are being made to employ films of practically double the normal width (35 mm.); this enables a wider and more panoramic picture to be obtained, better suited to big scenic effects, and at the same time gives ample space for recording sound on the same film. The present practice is to use separate cameras for recording pictures and sounds, each with its own film running in step or synchronism, and the 65-mm. film or double-width film would eliminate this, provided the sound recording could be freed from interruption due to the vibration and noise of the camera proper.

But Press photography with the motion-picture camera is tending in the same direction, as here portability is of the utmost consequence. The picture and its accompanying 0.10-in. wide sound record are more conveniently photographed on the one film of 35 mm. width.

An interesting type of portable camera for sound-film work has been recently introduced, in which the sound equipment is fixed on top of the camera and portability has been largely secured by the design of a special small type of mirror galvanometer. Light from a metal-filament lamp is focused on to the mirror of the galvanometer, which rotates around a vertical axis; the reflected beam is thrown on to a second fixed mirror, which reflects it again into an optical part termed the focusing barrel. This concentrates the varying beam of light and throws it on the narrow film track in the form of a band of light of varying width (area). The galvanometer is of the fully-enclosed mechanically-damped type. The light source has been reduced to a 4-volt, 0.75-A lamp. The current for the microphone undergoes three stages of audio-frequency amplification; the total available undistorted power output is about 80 milliwatts.

Some idea of the intensity with which sound-picture problems are being attacked may be gathered from the recent activities of some of the technical organisations concerned. The Vitaphone Corporation, for instance, has designed a portable laboratory truck for diagnosing, by oscillograph records, the acoustic defects of theatres; reverberation, echoes, the distortion caused by loud-speakers, and so on, can be studied *in situ*, and arrangements are even provided on the truck for developing oscillograph records on the spot.

Although finality has by no means been reached in microphone matters, the practice of mixing the output of a number of microphones into the recording amplifier is fairly general. Some new work has been done recently by the R.C.A. Victor Company in the way of arranging, in the mixing of four or eight microphones, a constant output level in the amplification, with constant impedance. As improvement continues in photography and the recording circuit, it is probable that considerable scope will appear for further improvement in the microphone itself.

From the mechanical standpoint, it is interesting to watch the transition from the "blimp"-protected sound-recording camera, isolated from the noise of the taking camera, to the combination camera which both takes pictures and records sounds as indicated above. Big improvements are taking place at the moment in this direction, and it would appear probable that such silent running will eventually be obtained that the two apparatus will be coupled together, and the use of synchronous motors for separate drives as at present will be obviated.

An indication of the wide scope offered by the kinematograph art from the electrical standpoint may be gathered from some recent patents. G. Seeber, for example, has devised a method of incorporating a magnetic alloy of nickel, cobalt, and iron, divided into colloidal particles in the celluloid "kine-film" base. The amplified currents of the microphone will impress such a magnetically susceptible base with a permanent "strain" which, on the subsequent passing of the film between the poles of a sensitive telephone, will reproduce the original sounds. This is, of course, merely an elaboration of the Poulsen magnetised-wire and of the Stille recorders now being used experimentally by the B.B.C.

Another interesting electrical offshoot of sound pictures is the process of Sémat and Champilou—a method of transmitting electrically a motion picture film complete with sound record. The sound reproduction is effected by the mechanical cutting of a groove on a cylinder of suitable material, the magnetic cutter being controlled by the strength and frequency of the telegraphic impulses.

Many other examples might be quoted of electrically involved developments of the talking-picture art. They are worthy of the attention of the electrical engineer, if only because the picture industry is already the third largest in the world.

T. Thorne Baker, F.Inst.P., A.M.I.E.E.

Parliamentary Notes

[By our Special Parliamentary Reporter]

The Vote of Censure

On April 16th the Opposition moved a vote of censure on the Government for having "failed to carry out their election pledges with regard to unemployment and having ceased even to attempt remedial measures."

Mr. Johnston, the Lord Privy Seal, defending the policy of the Government, dealt with the effect of electrification on unemployment, and said that, apart from the ordinary operations of the Central Electricity Board, the Government had provided grants to stimulate fresh schemes to the amount of £14,000,000. The report on the electrification of the railway system, which had been signed by the three members of Lord Weir's Committee, emphasised the vital importance to the nation of a progressive railway system and the need of reducing costs in the face of road transport competition and economic depression. The availability at a low price of electrical energy from the national Grid was an important new factor. The increased load which the electrification of the railways would contribute, together with its high load factor, was also regarded by the committee as bound to react favourably on the cost of electrical energy produced for all purposes, while the additional transmission network would do much to accelerate rural electrification. Apart from the possible special expenditure of £45,000,000 in intensifying suburban services, the committee estimated that a progressive programme, covering the whole railway system and carried out over a period of from 15 to 20 years, would involve new capital expenditure of £260,000,000 on the railways, and a further expenditure of £80,000,000 on the part of the Central Electricity Board and other electrical undertakings. So far as the £260,000,000 was concerned, the Committee estimated, in the light of certain technical investigations, that a return of seven per cent. would be obtained in the shape of savings in expenditure as a result of the change-over to electrical working. The calculations were based on present traffic; they made no attempt to place a money value on less-easily measured advantages, such as speed, comfort, amenity, or improved services. On the expenditure to be incurred for the Central Electricity Board and other electrical undertakings, the Committee assumed that this would earn a return in the shape of charges for electricity supplied. A point of particular interest was that the Committee estimated the volume of employment to be afforded, direct or indirect, at an average of 60,000 men per annum for 20 years. Lord Weir and his colleagues pointed out that any decision involved many important national, financial, and other considerations, and the magnitude of the scheme would be unique in the history of world enterprise; but they added that they had no hesitation in concluding that the mere magnitude of the scheme involved in the complete electrification of the railways was no deterrent in itself to a most careful and earnest considera tion of such a programme on its economic and social merits. In that spirit the Government was proceeding to examine the conclusions of the Committee.

With regard to the telephones, plans had been made and work put in hand by the Postmaster-General for an extensive development of the system of automatic trunk calls, whereby it would be possible for subscribers 200 or 300 miles apart to get into communication as quickly as if they were making a local call. Steps had also been taken to inaugurate a publicity campaign.

The vote of censure was rejected by 305 votes to 251.

The London Passenger Transport Bill

It is announced that 77 petitions against the above Bill have been presented; they have been referred to the Joint Committee of both Houses which is to consider the measure.

Legal

Electrical Employer Fined

Eric P. Summers, electrician, of Perranporth, pleaded guilty at West Powder Petty Sessions, at Truro, on April 16th, to twelve offences of failure to pay contributions and to return health and unemployment insurance cards to three of his employés.

Mr. T. S. Williams, who prosecuted, said that defendant was before the court in June last, when he was fined ten shillings. Since then he had paid no contributions, and had not returned a single card to his employés. One employé, aged sixty-three, was ill, and could not obtain sickness benefit, and the failure of defendant to pay contributions might mean that the man and his wife would forfeit the old age pension. Deductions had been made from the men's wages. The Bench fined defendant £10, and ordered him to pay arrears, witnesses' expenses, and the costs of the prosecution, totalling £12 10s.

Fatality

Archibald John Judd, an employé of Lowestoft Corporation, received a fatal electric shock on April 15th whilst working on an overhead line at Kessingland. It is reported that he was preparing to fix a new line when he slipped. His safety belt prevented him from falling to the ground, but apparently he came into contact with a "live" wire.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Salary Reductions and Income Tax

Among the many excellent features of the REVIEW is the hospitality you extend to articles which belong perhaps to the administrative side of an engineer's life rather than the technical—take, for example, the excellent study on "Superannuation" which appeared in your issue of January 30th last—and because of this hospitality I am tempted to submit this letter dealing with another "side line."

During the past few months, or perhaps a year or so, many suggestions have floated about to the effect that the time has arrived for reductions in salaries of officials of many grades, and in several concerns a reduction of 10 per cent. or so has already been made—the writer himself being affected to that extent; if what one hears in engineering circles to-day is correct, the time is not far distant when scores of men will be asked to make a similar sacrifice.

The purpose of this little homily is to urge those who may be called upon to make a sacrifice of this nature that they endeavour to clear up a point of difficulty in regard to Income Tax before they consent to the reduction. The point may be illustrated by taking the case of an official in receipt of, say, £600 a year, who agrees to a 10 per cent. reduction, thereby bringing his income down to £540 per annum. Owing to the method of assessment and taxing now in force, he will, for the first year in which this reduction operates, be called upon to pay Income Tax on the £60 he has lost as well as on his earnings, so that the law has the joke on him to the extent of taxing his losses as well as his gains!

When he lodges his protest, the Income Tax Inspector will probably point out that this overcharge will be "reflected"—as they term it—in the lower assessment for the following year. Of course it will!—"doing it on a man" once is quite often enough in general; but the point is that the return to the £600 a year may never come, yet the excess tax paid on this missing £60 cannot be reclaimed—not even when the official retires.

In cases of this nature it may mean that instead of paying the standard of 4s. 6d., the tax will go up to about 6s. in the £.

No reasonably minded man objects to paying the standard tax upon his income, but it certainly is not fair or right that because an official's salary is reduced he should pay tax on the amount lost as well as on that received in any one year.

May I suggest that those who are likely to suffer a salary reduction should look into this matter? If they find themselves affected they should take steps to get the question ventilated with a view to this grievance being removed.

April 18th, 1931. AN OFFICIAL.

[The "official" mentioned by our correspondent only pays tax upon his actual income of the previous year.—EDS., ELEC. REV.]

Why Fear the Peaks?

Who fears the peaks? Surely not the station engineers, for whose benefit I gather your article on page 617 was written, with their ample supply of standby plant! I know, however, many users who possess a very lively fear of one type of peak—some are engineers taking bulk supplies, others being industrial users, and the particular peak which troubles them most mightily is that feature known as the maximum demand item on their invoice. The operation and incidence of the m.d. system is, of course, well known to all supply folk, but the same cannot be said of the user nor of the person whom we are all anxious to catch, *viz.*, the factory owner who at the moment is a non-user. It is perhaps late in the day to rail at the m.d. system, it being, I gather, the method of charging to be used in respect of the grid supply, and from this high authority it will doubtless filter down to relatively small power users. In actual practice, however, one finds that if the maximum for the year comes on during the first month or two the account for this gets paid with only little complaint. But let a steady load run through to November or December and then be increased perhaps 20 to 30 per cent., then there is trouble at once; at any rate this is so with the many mill owners amongst whom I live and have my being!

As both a buyer and seller under the m.d. and other systems I can, I hope, appreciate the *pros* and *cons* of each, but to the industrialist it certainly is a shock to find that having demanded, say, an additional 10 kW in order to get through a rush job at the end of November he is met with a demand for possibly another £30 or so. It is of little use to tell him that having once put the meter reading up he can make use of this extra 10 kW until December 31st—he does not need it; and the sore point to him is that for services rendered for perhaps a day or two the £30 is an exceedingly high price to pay. It possibly is; but on the basis of an annual maximum demand there appears to be no way out of the difficulty. My own feeling is that there is a great deal to be said in favour of the m.d. being charged on a monthly basis, and if it could be done it would, I am certain, soften to a considerable extent the prejudice which is responsible for many factory owners deciding to keep off the public supply. One may argue, for example, that if the said owner has his own steam engine he cannot exceed its normal power, as it then slows down, and the engine certainly does give him a visible indication of excessive load by reason of its drop in speed, whereas the motor—stout fellow—will not slow down to the same extent, but will take all the additional current necessary to enable it to keep to the speed its maker stamped on the name plate.

Is it too late to advocate a system based upon a monthly instead of an annual maximum demand charge? I should like to think it isn't, for I am sure it would help matters along a good deal.

Shipley, Yorks., *April 18th*, 1931. W. HOWARD BROWN.

Combustion Control

I have read with some surprise the leading article on "Combustion Control" in your issue of March 27th. From the first paragraph of your article it might be assumed that the automatic boiler control installation at the new Leeds power station is the first one in this country. Several British power stations and industrial installations had installed boiler control equipment some time before Leeds, and the system installed has proved so satisfactory that in some cases repeat orders have been placed. I cannot quite agree that automatic control introduces complication, and further, the article makes one believe that automatic control is installed for the sole reason of providing a safety device in case of breakdowns. Although this may be an additional advantage it is certainly not as important as the saving in fuel and the more constant steam pressure obtained where automatic control is in operation. These advantages, which are more pronounced with a varying load, are still of such importance on a more or less constant load that it is well worth while putting in automatic control. The assumption that the "method was first established for working with pulverised fuel firing" may mislead, because in 1928 automatic control was started up on four stoker-fired Babcock boilers in a works in London (where incidentally it saved so much coal that the capital cost was amortised within a year). In May of the same year two boilers with similar control were put into service at Stoke-on-Trent power station. With regard to your remarks concerning labour saving, a minimum number of attendants is required and a saving in labour therefore is not always possible. In installations in operation with the Hagan system it has not been found necessary to employ specially skilled labour, the equipment being of such simplicity that the average man can easily understand its operation and make adjustments if required. The last paragraph gives one the impression that automatic control is still in its infancy; with us this is not the case, as boilers with a total of over 100,000,000 sq. ft. of heating surface have been in continuous operation for over 10 years all over the world.

London, *April 16th*. J. E. O'BREEN, F.Inst.F.

[This letter has been shortened slightly. We certainly have not suggested that Kirkstall is the first automatic installation in this country, nor that automatic control introduces complication or is installed only as safety apparatus.—EDS. ELEC. REV.]

Petrol-electric Vehicles

With reference to the letter of Messrs. T.S. Motors, Ltd., which was published on March 13th, I wish to say that the electrical drive for the omnibus to which I referred in my article was constructed by an English firm and supplied to a very well-known London omnibus company. The drive was purely an electrical one and was constructed more especially to demonstrate the superiority of a series-wound dynamo. An abstract from the report on this set states that "it was the best proposition so far handled.....the drivers were delighted with the drive." One can safely assume that the company referred to had full knowledge of the performance of other petrol-electric systems employing a compound-wound dynamo, including that of Messrs. T.S. Motors, Ltd.

Viewed from the usual theoretical standpoint, it might be thought that the inherent characteristics of a series-wound dynamo might not be as suitable as one wound otherwise; however, in practice the reverse is the case.

The widely differing characteristics of shunt or differential windings (as advocated in America) and of compound windings (as advocated by Messrs. T.S. Motors, Ltd.), indicate that there exists a great diversity of opinion as to the best method of exciting the dynamo. I know from experience that the series-wound dynamo is preferable to one wound otherwise, and I feel certain that your correspondents would confirm this if they carried out experiments in this direction. Although I use a rather special construction for the dynamo and motor, I have no doubt that, so far as the regulation is concerned, there would be no difference in machines of the usual construction.

Notwithstanding the favourable report of the electrical drive mentioned, objection was made to the low efficiency of transmission, compared with the ordinary gear box, when the engine was running direct. To overcome this I now embody a clutch in the design, as described in my article. By slightly modifying the electro-mechanical transmission to suit engines of different speeds the electro-motor may be run at the same

speeds for starting and hill climbing conditions as in a purely electrical drive. At the same time an efficient gear ratio for the back axle is obtained.

None of the good features of the purely electrical drive are appreciably sacrificed. Although the average engine speed in some applications may be slightly higher than with the ordinary electrical transmission, it must be fully borne in mind that the average engine load is very much less owing to the gain in the average efficiency with an electro-mechanical drive.

Although not stated in my article, I wish to say that, in some applications, to obtain the most economical running speeds with a comparatively low-speed engine, and at the same time to provide an efficient gear at the back axle, it will be found desirable to interpose a permanent speed-increasing means between the engine and the dynamo instead of directly coupling these machines as shown in fig. 1 of my article. Incidentally, the cost and weight of this would be more than offset by the lower cost and weight of the dynamo, owing to its higher speed; or in some cases it would be well to arrange the gear ratio so that the clutch was only in operation over a range of road speeds below the highest obtainable. I desire to emphasise this point because, first, an omnibus is infrequently required to run at what is known as "over speed" and, secondly, for the reason that with the series divertor control no complication exists in rapidly reverting to the electrical drive for the highest speeds. There is, for every application, a range of road speeds below the maximum obtainable at which great economy is derived by driving direct from the engine to the back axle.

The reasonableness of the objection raised by engineers associated with mechanical transport to the heavy losses in an electrical transmission at the higher speeds must be admitted. I therefore suggest that before much real progress is made with electrical transmission it will be necessary to devise methods for eliminating these losses without detracting from the valuable features associated with purely electrical speed-transforming means. The electro-mechanical transmission which I have described achieves this purpose.

As I am residing abroad my copy of the Electrical Review did not arrive until March 31st. Hence the lateness of this reply.

Pasadena, Cal., U.S.A., *April 4th*, 1931. J. W. Burleigh.

Breakdown Insurances

I should be glad to have your readers' views on the necessity or otherwise of insuring electrical plant against breakdown. Can anyone advise me how far to go with such insurance? Does it really pay to insure, and do insurance companies "play the game" when breakdowns occur? Would it be advisable to insure a plant consisting of about 80 h.p. of motors of various sizes, and another where only six motors are installed with a total output of roughly 33 h.p.?

April 17th, 1931. Engineer-in-Charge.

Electric Fires

May I make it clear that I do not regard the panel heaters referred to by your correspondents in this week's issue as convectors. I think it is pretty generally recognised that they are not. The classification used in the article was, broadly, luminous as against non-luminous heaters. I agree that to anyone interested particularly in non-luminous radiators the classification may seem arbitrary. The last sentence, to which they refer, indicates that luminous heaters, giving "apparent" heat, are desirable for psychological reasons. Your correspondents have, I think, overlooked the fact that the article dealt primarily with domestic heating, and not with the heating of halls or similar lofty premises.

April 18th, 1931. A Consumers' Engineer.

Careers for Young Engineers

With reference to this subject, I fully agree with the letter of "Optimistic" in the Electrical Review of February 20th. In my own case I deliberately entered another branch of electrical engineering after terminating my apprenticeship, as "Despair" has done (but at a smaller remuneration than he)—but I was getting a training in a new line, which was (I hoped) to pay a dividend later. This actually happened, as it was the extra weight in the balance, when I was selected for a post abroad. In the words of a great British engineer, who has lately passed away, "Industry requires its young brains to generalise its training and broaden its experience. Specialisation comes easier due to the mental balance this brings."

Regarding Employment Exchanges mentioned by "Curious" (February 27th) for posts abroad—this is a subject I have discussed with many young engineers, and with few exceptions the verdict is "leave them alone." I some time back replied to an "E.R." Box No. for a post, and the too prompt reply came from a firm of "employment specialists," with a letter stating that my qualifications were suitable, and if I would sign away a large percentage of the salary offered for the next three years—to operate if I was appointed—they would introduce me to their principal.

I would advise all young engineers to avoid these parasites on their brains and their ambition. Employers of technical men should also note that they fail to find the best type of man by this means, as the man who knows his ability refuses to *buy* a job. A current opinion among young engineers—true or untrue—is that the desirable type of employer would not shield behind agencies. Use a Box No., certainly, but treat the selected applicants with the courtesy due to a prospective member of a technical staff, and not submit them to grasping exploitation.

B.C.A., *March 28th*, 1931. C. E. P.

Motor Impregnation

In his letter of March 27th Mr. Dunlap expressed surprise that there *could* be two opinions regarding the superiority of vacuum impregnation, and proceeded to quote instances which proved to his satisfaction the effectiveness of this method. This letter was followed by others from Messrs. H. Mawdsley and R. T. Fleming, advocating different methods of treating the wire before winding, and Mr. Mawdsley quotes a specific case as a proof of the superiority of his method. I can give details of several motors treated by the much despised hot-dipping method which have been running for several years in a dairy, and of others which have been operating for a considerable time in a laundry, and, although these machines are not totally enclosed or pipe ventilated, and work in extremely damp and steamy atmospheres, they have given no trouble whatever. On the other hand, in the ordinary course of business I have seen dozens of armatures opened up or stripped, some of which have been vacuum impregnated, some treated before winding, and some hot-dipped, and yet they have all failed in service under much easier conditions than the various instances quoted above. It is noticeable that in a great many cases the penetration of windings treated by the vacuum process, or even pressure-vacuum process, is not nearly so great as many people appear to imagine, and in the case of a very-tight comparatively fine-wire winding, it is little better than that obtained by hot-dipping properly carried out.

Mr. Dunlap refers to the "entrapped moisture" in the winding eventually causing verdigris and ultimate breakdown. It is surely a first and most elementary principle that all moisture should be dried out of the armature before impregnation, whatever process be used, and it is difficult to see why this should be specially mentioned in connection with hot-dipping; surely "entrapped moisture" is just as dangerous in connection with any other process. It may be that neglect of this important point accounts for the unfortunate series of breakdowns and consequent losses of sleep mentioned by Mr. Dunlap. It is also very doubtful whether the "greening" which is often found in windings has anything to do with verdigris, the actual cause of this being a debateable point, even among varnish manufacturers, although the generally accepted opinion is that it is caused by an ingredient of the varnish.

In his further letter in your issue of April 17th Mr. Dunlap again roundly condemns every method of impregnation other than vacuum-pressure, which he describes as the "simplest." I maintain, from experience, that if a winding is thoroughly and properly dried out and then immersed whilst still hot in a tank of varnish of sufficient depth to provide a good "head," or depth, of varnish over the winding, and is allowed to remain in this for some considerable time after all bubbles have ceased to rise, that very effective impregnation will result. It is essential, however, that a thin good-quality varnish of high penetrative power should be used, and not one of the cheaper thick gum-loaded varnishes which require a considerable amount of thinners or solvent added before use.

It must be remembered that the insulation, both to earth and between turns, of a properly designed winding, should be amply sufficient to prevent breakdown without the added di-electric strength of the varnish, the only real purpose of the latter being to keep out moisture. Therefore so long as the varnish penetrates sufficiently far into the winding to effectively seal up all crevices, &c., even if not penetrating right to the heart of the winding, it will effectively resist the entrance of moisture and protect the winding. The method of double impregnation advocated by Mr. Dunlap is certainly an advantage, as the second impregnation should seal up any tiny cracks or pinholes which might possibly occur in the oxydised skin on the varnish of the first impregnation.

In conclusion, I am from actual experience confident that, whilst vacuum-pressure impregnation is undoubtedly excellent, very good, and in many cases equally effective, results can be obtained by hot-dipping, provided that this latter method is properly carried out, which is not always the case.

E. J. Wilcock, A.M.I.E.E.

Birmingham, *April 20th*, 1931.

We have followed with interest the discussion in your columns on motor impregnation, and we are particularly pleased to see Mr. Ravenscroft's contribution, as we consider that he has put his finger on the vital spot when he says . . . "many manufacturers . . . . have much to learn with regard to the chemical and physical properties of the varnishes and compounds which they use." Our own experiences in the insulating field have shown us clearly that 99 per cent. of insulation difficulties—particularly where the smaller manufacturers are concerned—are due to the lack of this fundamental knowledge and the consequent inability to make independent tests of the materials offered to them for insulation purposes. The usual procedure in such cases is that the manufacturer, having found by a process of trial and error that a certain varnish gives him passable results, then takes it for granted that this varnish will do for all his work, and goes on doing so until he meets trouble, when he blames the varnish, tries other makes until he finds one which suits, and the circle

goes on *ad infinitum*. This may sound somewhat exaggerated, but we have had many cases of this sort, and upon investigation we have always found that the manufacturer, although often understanding thoroughly the actual technique of impregnation, has no idea of the behaviour of drying oils, resins, &c., when compounded into a varnish.

Given that an insulation engineer knows the approximate composition of the varnishes he uses, and has a knowledge of the differences in the behaviour of linseed oil and china wood oil, and of the differences of the various resins used in varnish making, then adequate and proper insulation will follow as a matter of course. To such an engineer the idea of using one varnish for the whole of this work would appear supremely ridiculous. Finally, may we support with all our heart Mr. Ravenscroft's plea for greater co-operation between the varnish manufacturer and insulation engineers in the shops? It does not seem to be realised generally that the sales engineer of a reputable insulating varnish manufacturer must of necessity be a highly trained individual, with a knowledge of insulation from the raw varnish materials to the finished motor in the shops, and having at his finger ends a knowledge of higher organic chemistry, physics, mechanical and electrical engineering, and a whole lot of other highly technical subjects so that he is capable of co-operating with the manufacturer to the fullest degree to demonstrate how insulation can be obtained in the most economical manner, using the proper materials.

It is no light thing to undertake such a service, but we ourselves have always taken the standpoint that our reputation demands that we must be in the position to render proper technical service to any of our friends wherever and whenever required, and to offer them our fullest co-operation in the solution of their insulation problems.

Lewis Berger & Sons, Ltd.,
F. Allen, *Joint Managing Director*.

London, E.9, *April 20th*, 1931.

Leakage Trips for 100-A Circuits

All installation engineers, at least, will agree with Mr. Grierson that superfluous details should be omitted from any future edition of the I.E.E. Regulations, but I do not consider that he has made out any sort of case for the throwing overboard of Regulation 94F. I have up to the present interpreted this Regulation in a rather different way to Mr. Grierson, and should be glad to know if I am wrong.

Mr. Grierson seems to consider that it is framed to deal with earth faults, whereas I have thought that it was intended to apply to the insidious current leakage that occurs on most installations, and is greater on the larger installations. He is perfectly correct in stating that the ordinary switch-fuse can deal with the earth fault, but an earth leakage of a few milliamperes is rather more difficult, and most purely overload protective devices cannot afford protection against this.

The Commissioners have thought fit to place a definite limit on the permissible leakage from low-pressure networks, but there is not much doubt that a large amount of this leakage takes place in consumers' installations, and the general observance of Regulation 94F would appear to be a big step forward in the direction of limiting this leakage. At a time when the L.C.C., to mention one body only, is pressing for compliance with this regulation on all installations under its control, thus indicating an understanding of its import, it would hardly be seemly for the Wiring Regulations Committee to consider scrapping it.

The question of cost is not quite so black as Mr. Grierson has painted it, as for his 20-kW installation he can get an excellent overload and earth-leakage ironclad main switch, with oil immersed contacts, for between £7 and £8; this is 3-phase, and 40 amperes per phase, it is true, and will thus probably be anathema to Mr. Grierson. It will, however, trip the switch with an earth leakage as low as 20 milliamperes.

The more general use of earth-leakage trips on main or circuit switches would not greatly increase the cost of installations. I know of an excellent 25-ampere switch, with 15-milliampere earth-leakage trip, which can be bought for 22s., and can be fitted with overload devices if required, which makes the cost 50s. An ordinary ironclad switch-fuse would certainly not cost quite as much as this, but neither would it afford equal protection to the circuit, the apparatus, or the user.

Mr. Grierson is rather sweeping in his statement that no single case has been brought to his notice in 25 years in which the observance of Regulation 94F would have prevented an accident; the equipment of all installations 25 years ago with efficient low-current leakage devices, operating on a few milliamperes, would have prevented every domestic fatality that has occurred since then.

Folkestone, *April 20th*, 1931. T. C. Gilbert.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1929

28,439. "Two-way amplifiers for telephone and like circuits." International General Electric Co., Inc. September 19th, 1928. (319,287.)

28,546. "Synchronisation of television, picture-transmitting apparatus, and the like." Telehor Akt. Ges. April 5th, 1929. (345,610.)

28,678. "Method of selectively calling wireless stations." Dr. A. Ristow. September 17th, 1929. (Addition to 344,462.) (345,666.)

35,109. "Electric liquid-level measuring instruments." H. C. Heide (Moto Meter Gauge and Equipment Corporation). November 16th, 1929. (345,653.)

36,064. "Electric induction furnaces." D. F. Campbell and Electric Furnace Co., Ltd. November 25th, 1929. (345,635.)

36,311. "Pressure-relief devices for the containers of oil-immersed electrical apparatus." General Electric Co., Ltd., and J. Goodman. August 18th, 1930. (345,681.)

38,307. "Light-sensitive relay systems." Dr. W. Baseler and F. Hofmann. December 24th, 1928. (345,636.)

39,178. "Indicating scales such as are used with tuning controls of wireless receivers." Gramophone Co., Ltd., A. H. Cooper, and A. G. D. West. December 21st, 1929. (Addition to 25,963/29.) (345,660.)

39,378. "Telephone and like systems." Standard Telephones and Cables, Ltd. (C. E. Steven). December 24th, 1929. (345,622.)

39,393. "Protractor circle for use in wireless direction finders." J. J. V. Armstrong (Telefunken Ges. für Drahtlose Telegraphie). December 24th, 1929. (345,663.)

39,622. "Damping arrangements for acoustic intsruments." Standard Telephones and Cables, Ltd., and W. A. Loveday. December 27th, 1929. (345,679.)

1930

217. "Electric condensers." D. N. Davies and Bakelite, Ltd. January 2nd, 1930. (345,689.)

711. "Service meters for telephone systems." Siemens Bros. & Co., Ltd., and F. Baker. January 8th, 1930. (345,702.)

728. "Combined lighting and ignition electric generators for use with internal-combustion engines." British Thomson-Houston Co., Ltd., C. J. Morton, and J. H. Pollard. January 8th, 1930. (345,703.)

1,021. "Electric motor control systems." Associated Electrical Industries, Ltd. January 16th, 1929. (345,709.)

1,236. "Electric welding apparatus." W. R. Hume and Hume Steel, Ltd. January 13th, 1930. (345,716.)

1,687. "Electric gramophone pick-ups." Ideal Werke Akt. Ges. für Drahtlose Telephonie. October 29th, 1929. (345,721.)

1,725. "Radio apparatus employing ganged condensers." Pye Radio, Ltd., and E. V. Root. January 17th, 1930. (345,722.)

2,219. "Lamp panel for exhibiting electric moving inscriptions by means of small incandescent lamps." E. J. Muller. January 22nd, 1930. (345,733.)

2,674. "Telephone systems." Siemens Bros. & Co., Ltd., and C. L. Peters. January 25th, 1930. (345,741.)

3,735. "Electric strain insulators." W. R. Millar. February 4th, 1930. (345,749.)

3,900. "Electric regulators." International General Electric Co., Inc. February 5th, 1929. (345,751.)

4,356. "Means for obtaining unidirectional electric current at constant potential difference." S. G. Brown. February 8th, 1930. (345,756.)

4,474. "Electro-magnetically operated mercury switches." General Electric Co., Ltd., and J. J. V. Connaughton. February 10th, 1930. (345,757.)

5,248. "Exploring devices for use in television, photo-telegraphic, or like systems." R. G. Wilson and A. A. Waters. February 17th, 1930. (345,770.)

6,128. "Sparking plugs." Lissen, Ltd., and R. P. Richardson. February 24th, 1930. (345,779.)

6,129. "Electrical condensers." Igranic Electric Co., Ltd., and H. S. Payman. February 24th, 1930. (345,780.)

6,130. "Acceleration control of electric motor-driven devices." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.) February 24th, 1930. (345,781.)

6,389. "Systems of electric motor control." British Thomson-Houston Co., Ltd. February 26th, 1929. (345,785.)

6,542. "Telephone systems." Siemens Bros. & Co., Ltd., and A. J. Escott. February 27th, 1930. (345,787.)

7,219. "Magnetic electric contact breakers." British Thomson-Houston Co., Ltd., and L. Griffiths. March 5th, 1930. (345,792.)

8,163. "Devices for re-winding the record carriers of magnetic dictating machines." W. Klappenecker and Telegraphie-Patent-Syndikat Ges. March 13th, 1930. (345,804.)

9,653. "Electrical earthing tubes and the like." A. B. Simmonds. March 26th, 1930. (345,815.)

10,242. "High-frequency amplifiers." Marconi's Wireless Telegraph Co., Ltd. March 29th, 1929. (345,822.)

11,101. "Dynamo-electric machine." W. Fairweather (Singer Manufacturing Co.). April 8th, 1930. (345,828.)

11,353. "Electric switches." F. M. Laserson. April 9th, 1930. (345,830.)

12,043. "Electric installation for the combined transmission of sounds coming from several sources of sound." Soc. Anon. Elecson. June 21st, 1929. (345,840.)

14,348. "Arc-extinguishing devices, particularly for electric circuit interrupters." Associated Electrical Industries, Ltd. May 10th, 1929. (345,871.)

14,985. "Elements for electric furnaces." International General Electric Co., Inc. May 15th, 1929. (345,874.)

15,816. "Thermal switches for controlling electrical apparatus." Aktiebolaget Birka Regulator. May 25th, 1929. (345,881.)

17,035. "Telephone pay stations." Telephon-Apparat-Fabrik E. Zwietusch and Co., Ges. November 2nd, 1929. (345,887.)

18,199. "Sparking plugs." Soc Française des Bougies a Electrode de Platine. November 28th, 1929. (345,892.)

19,389. "Radio direction-finding apparatus." Telefunken Ges. für Drahtlose Telegraphie. July 26th, 1929. (345,899.)

19,617. "Contacts for electric switches and the like." International General Electric Co., Inc. June 28th, 1929. (345,901.)

19,868. "Protective devices for electric circuits." British Thomson-Houston Co., Ltd. June 28th, 1929. (345,903.)

22,288. "Magneto ignition in internal-combustion engines." J. C. Hadley. July 24th 1930. (345,912.)

22,709. "X-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 2nd, 1929. (Addition to 286,436.) (345,914.)

23,485. "Electric cables." Kabelfabrik- and Drahtindustrie Akt. Ges. August 5th, 1929. (345,915.)

24,515. "Electric cable-end sleeves." Siemens-Schuckertwerke Akt. Ges. August 28th, 1929. (345,917.)

25,240. "Duplex radio communication." Telefunken Ges. für Drahtlose Telegraphie. September 16th, 1929. (345,918.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 15th:—

Anabrite. No. 520,908. All goods in Class 6.—London Electric Wire Co. and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, E.C.1.

Jannaco. No. 519,828. Class 8. Electric cables and flexibles.—J. Applebaum, trading as the City Incandescent Light Co., 54, Shudehill, Manchester.

The Joker. No. 520,350. Class 8. Instruments and apparatus for reproducing, recording, transmitting and receiving sound.—Wireless Music, Ltd., 11, Whitehall, S.W.1.

Pentrovol. No. 520,868. Class 8. Telegraphic and telephonic instruments and apparatus and parts thereof.—Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.

Radenite. No. 520,935. Class 8. Electrical batteries.—Van Raden & Co., Ltd., 567, Foleshill Road, Great Heath, Coventry.

Steamship Brand (lettering and design). No. 518,161. Class 13. Electric torches.—The Nam Jam Factory, Kowloon, Hong Kong.—(British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Yotto. No. 520,014. Class 13. Electric lighting and heating fittings.—Wholesale Fittings Co., Ltd., Commercial Street, E.1.

Dusk. No. 520,165. Class 13. Electric lighting fittings.—The Arts Products Co., 5, Corporation Street, Birmingham.

Travello. No. 521,038. Class 13. Electric irons.—L. S. Mayer (London), Ltd., 12, New Union Street, E.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Reconstruction of Queen's Cross Church; G. Wall, architect, 214, Union Street. Reconstruction of Liverpool Insurance Society Buildings, Union Street; George Mitchell & Sons, architects, West Craibston.

BARKING.—Factory, River Road; A. Ibbotson & Son. Additions, West Bank; British Petroleum Co., Ltd.

BATHGATE.—Baths for the Corporation; burgh surveyor.

BEDFORD.—Extensions, Goldington Road School; G. P. Allen, architect. Alterations, R.C. Schools, Priory Street; Rev. Canon Tonks.

BEESTON.—Houses (90), Fields estate (£28,570); H. R. Hofton and Son.

BELPER (Derby).—Houses (40) for the R.D.C.; G. Pym, clerk, 122, Bridge Street.

BILSTON (Staffs.).—Houses (144), Darlaston Road; W. G. Lofthouse, architect.

BLACKWELL (Derbyshire).—Houses (48), South Normanton, for the R.D.C.; surveyor.

BOLTON.—Extensions to school buildings, Bury Road, for Breightmet Wesleyan Church managers; R. Fernhead, architect, 41, Mawdsley Street.

BRADFORD.—Rebuilding of Oddfellows Arms Hotel, Harrogate Road; Leeds & Wakefield Breweries, Ltd.

BRISTOL.—Swimming baths, Avonmouth (£33,400); city engineer.

BROMLEY (Kent).—Houses (38) for H. F. Thoburn.

BROWNHILLS (Staffs.).—Houses (150) for the U.D.C.; surveyor.

BUCKINGHAMSHIRE.—Rebuilding Chesham police station (£8,735) for the C.C.; Rust & Ratcliffe, builders, Chesham.

BURTON-ON-TRENT.—Garage, Swadlincote, for the Birmingham Midland Omnibus Co., Ltd.; G. Hodges & Son, builders, Horninglow Street.

BURY.—Flats (56), near Ainsworth Road; borough engineer, Bank Street.

CARLISLE.—Houses (230) for the T.C.; city surveyor. Extensions of Caldewgate, for Carr & Co., Ltd.; H. E. Scarborough, architect. Additions, Warwick Road Cinema, for Sydney Bacon's Pictures, Ltd.; P. L. Browne & Son, architects. Alterations, omnibus garage (£5,000); borough engineer.

CARSHALTON (Surrey).—Houses (78) for the U.D.C.; surveyor.

CHELTENHAM.—Grammar school; R. S. Phillips, education architect, Gloucester.

COVENTRY.—Presbyterian church, Radford Road (£8,000); J. G. Gray, builder.

DARWEN (Lancs.).—Public baths; borough engineer.

DERBYSHIRE.—School (600 places), Alfreton, for the county E.C.; director of education, Derby.

DEWSBURY.—Theatre for Playhouse (Dewsbury), Ltd.; J. Wimpenny & Co., builders, Linthwaite, Huddersfield.

DUDLEY.—Clinic, Tipton Road; Guest Hospital governors. Alterations, Imperial Buildings, High Street; F. W. Cook and Son, Ltd. School, Brewery Fields estate, for the E.C.

DUMFRIES.—Houses (32) for the T.C.; burgh surveyor.

DURHAM.—School, Coundon, for the county E.C.; Pearson and Co., builders, West Hartlepool.

GAINSBOROUGH.—Slipper baths for the U.D.C.; Eyre & Son, architects.

GILLINGHAM (Kent).—Houses (36) for the T.C.; A. V. Stinton, builder. Rainham. Houses (27), Maple Avenue, for A. T. Vincent & Son; F. T. Mattocks, architect.

GLASGOW.—Alterations, Coliseum Picture House (relighting, &c.); the manager. Building, Victoria Road, for the Bank of Scotland; the manager. Additions and alterations, High School (£60,000); city architect.

HAMPSHIRE.—Secondary school, Brockenhurst, for the county E.C.

HAMPTON (Middlesex).—Alterations, 29, Ashley Road; National Provincial Bank, Ltd.

HEANOR (Nottingham).—Extension of Primitive Methodist Church; trustees.

HORNCHURCH (Essex).—Church (£8,000); Rev. J. B. Carlos, vicar.

HUDDERSFIELD.—Rebuilding Radcliffe Arms (electrical work); Abbey & Hanson, architects, 11, Cloth Hall Street.

KIDDERMINSTER.—Extensions, Bennett Street school, including domestic subjects' centre, for the borough E.C.; Pritchard, Godwin & Clist, architects, Bank Buildings.

KILMARNOCK.—Houses (50) with electrical work for the T.C.; Anderson & Innes, builders. Houses (100), Townholm, for the T.C.; Robert Armour, 38, Bank Street.

LIVERPOOL.—Houses (28), Springwood estate; city engineer. Church, Anfield; incumbent of St. Columba's. Church and halls, Mather Avenue and Bookers Lane, for the Presbyterian Church of England; Morton & Dobie, architects, Dale Street. New St. Christopher's Church, Norris Green; curate-in-charge.

LONDON (Ilford, E.).—Congregational Church, Woodford Avenue; L. H. and R. Roberts, builders, 144, Lower Clapton Road, E.5. (Leyton, E.).—Junior school, Connaught Road (£39,000), for the borough E.C.; director of education. (Leytonstone, E.).—Additions to the Tom Hood Central School, Cobbold Road; A. E. Symes, Ltd., builders, Carpenters Road, Stratford, E.15. (E.C.).—Buildings, 41-2, King William Street and 20-5, Fish Street Hill; Northern & London Investment Trust, Ltd. (S.E.).—Offices and headquarters, National Society of Operative Printers and Assistants, Borough Road and Milcote Street (£33,444); C. H. Gibson, Ltd., builders, Croydon. (Mortlake, S.W.).—Baptist church, East Sheen; secretary, London Baptist Association.

LOWESTOFT.—Additions, Oulton Rock estate; Primitive Methodist Church trustees. Stores, Rant Score; Yare Barrel Factory Co., Ltd.

LUTON.—St. Andrew's Church; Rev. J. Woodhouse, vicar.

MANCHESTER.—Reconstruction of the Café Royal Buildings, Peter Street; Elcock & Sutcliffe, architects, 60, Strand, London, W.C.2. Installation of an electric passenger lift, 38, George Street; Mills & Murgatroyd, architects, 23, Strutt Street.

MARKET HARBOROUGH.—Cherry Tree Hotel, Coventry Road; Eady & Dulley, Ltd.

MITCHAM (Surrey).—Extensions, Isolation Hospital (£27,000); Wandle Valley Joint Hospital Board.

MOTHERWELL.—Houses (80), Wellington Street, for the T.C.; burgh surveyor.

NEWCASTLE-UPON-TYNE.—Improvements at Royal Station Hotel, including the installation of 54 electric fires; L. & N.E.R. Co.'s architect, King's Cross Station, London, N. Alterations, and improvements to premises of Bainbridge & Co., Market Street; F. J. Hepple, contractor, Dunn Street. Alterations and extensions to premises of Auto Garages (Northern), Ltd., 121, Northumberland Street; Ferguson & Sons, contractors. New wing to Cathedral Nursing Society's Home, Osborne Road; F. E. Dotchin, architect, 46, Grainger Street. Extension of Raby Street School (£11,500); Thos. Curry & Sons, builders.

NEWPORT (I.O.W.).—Houses (74) for the T.C.; borough surveyor.

NORTHAMPTON.—Structural alterations, Exchange Cinema; Gaumont British Corporation, Ltd. Stores, Chaucer Street; Goodliff Manufacturing Co., Ltd.

NORWICH.—Fire station for the T.C.; S. Livock, architect. Reinstatement of silk mills, Oak Street, for F. Hinde & Hardy.

OLDHAM.—Washhouses (£12,000); borough engineer.

OXFORD.—Elementary school, Marston Road, for the E.C.

PETERBOROUGH.—Additional storey for new municipal building; John Thompson & Son, Ltd., contractors, 165, Cromwell Road.

PLYMOUTH.—Rehousing, Peel Street area; borough engineer.

REIGATE.—Garage, Leabourne Road, for the East Surrey Traction Co., Ltd.; H. C. Waters, builders, Station Road, Redhill.

ROYSTON (Yorks.).—Houses (120) for the London, Midland and Scottish Railway Co., Ltd.

ST. ALBANS.—Houses (32), Redbourn, for the R.D.C.; surveyor.

SANDERSTEAD (Surrey).—Fire and ambulance station, Limpsfield Road; U.D.C.

SEDGFIELD (Durham).—Electrification of Chilton Lane pumping station for the U.D.C. (£250).

SHEFFIELD.—Houses (4,000) during the next two years; city architect.

SIDCUP.—Rebuilding of the "Woodman" public house for Reffell's Brewery; E. H. Burgess, builder, 20, Grosvenor Gardens, Victoria, S.W.1.

STAFFORDSHIRE.—Junior school, Stone, for the county E.C.; director of education, Stafford.

STOCKTON-ON-TEES.—Houses (600) for the T.C.; J. P. Wakefield, borough engineer.

STRETFORD.—Houses (90), Ayres Road; Spare & Stevens. Extensions of joiner's shops, Park Road; D. Anderson & Son, Ltd. Washhouse, Old Trafford; P. Howard, architect, 88, Mosley Street, Manchester.

STURRY (Kent).—Houses (32) for Blean R.D.C.; F. J. Eates and Sons, builders, Herne.

TADCASTER (Yorks.).—Extension of Kippax sewage disposal works; surveyor to the R.D.C.

THETFORD.—Reconstruction of Green Dragon Market Place; Bullard & Sons, Ltd.

TORQUAY.—Infants' school, Barton; B. Widdows, architect.

TYNEMOUTH.—School, Chirton Farm estate, for the E.C.; Haye & Gray, architects, Camden Street, North Shields.

WALTON-ON-THE-NAZE.—Headquarters for the British Legion Club; F. H. Durant, architect, Frinton-on-Sea.

WATFORD.—St. Mark's church, Leggatts Way; incumbent.

WHITEHAVEN.—Houses (80) and flats (20), Seacliff site, for the T.C.; borough surveyor.

WIVELISCOMBE (Somerset).—Reconstruction of cider factory for Arnold & Hancock, Ltd.

WORCESTER.—Houses (242), Barnes Hall estate; city engineer.

YORK.—Hotel, South Bank (£10,000), for J. J. Hunt, Ltd.